SEQUENCE LISTING

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<120> TRANSFERRIN RECEPTOR GENES

<130> 1038-1221 MIS

<140> 10/043,344
<141> 2002-01-14

<150> 08/649,518
<151> 1996-05-17

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cta agt gct tgt agc gga ggg ggg tct ttt gat gta gat aac gtc tct   99
Leu Ser Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser
 15                  20                  25                  30

aat acc ccc tct tct aaa cca cgt tat caa gac gat act tca agt tca   147
Asn Thr Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Ser Ser
                35                  40                  45

aga aca aaa tct aaa ttg gaa aag ttg tcc att cct tct tta ggg gga   195
Arg Thr Lys Ser Lys Leu Glu Lys Leu Ser Ile Pro Ser Leu Gly Gly
            50                  55                  60

ggg atg aag tta gcg gct ctg aat ctt ttt gat agg aac aaa cct agt   243
Gly Met Lys Leu Ala Ala Leu Asn Leu Phe Asp Arg Asn Lys Pro Ser
        65                  70                  75
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ctc tta aat gaa gat agc tat atg ata ttt tcc tca cgt tct acg att   291
Leu Leu Asn Glu Asp Ser Tyr Met Ile Phe Ser Ser Arg Ser Thr Ile
     80                  85                  90

gaa gag gat gtt aaa aat gac aat caa aac ggc gag cac cct att gac   339
Glu Glu Asp Val Lys Asn Asp Asn Gln Asn Gly Glu His Pro Ile Asp
 95                 100                 105                 110

tca ata gtc gat cct aga gca cca aat tca aac gaa aat cgt cat gga   387
Ser Ile Val Asp Pro Arg Ala Pro Asn Ser Asn Glu Asn Arg His Gly
                115                 120                 125

caa aaa tat gta tat tca ggg ctt tat tat att caa tcg tgg agt cta   435
Gln Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Ile Gln Ser Trp Ser Leu
            130                 135                 140

aga gat tta cca aat aaa aag ttt tat tca ggt tac tat gga tat gcg   483
Arg Asp Leu Pro Asn Lys Lys Phe Tyr Ser Gly Tyr Tyr Gly Tyr Ala
        145                 150                 155

tat tac ttt ggc aat aca act gcc tct gca tta cct gta ggt ggc gta   531
Tyr Tyr Phe Gly Asn Thr Thr Ala Ser Ala Leu Pro Val Gly Gly Val
    160                 165                 170

gca acg tat aaa gga act tgg agc ttc atc acc gca gct gaa aat ggc   579
Ala Thr Tyr Lys Gly Thr Trp Ser Phe Ile Thr Ala Ala Glu Asn Gly
175                 180                 185                 190

aag aat tat gaa ttg tta aga aat tct ggt ggc ggt caa gct tat tct   627
Lys Asn Tyr Glu Leu Leu Arg Asn Ser Gly Gly Gly Gln Ala Tyr Ser
                195                 200                 205

cga cgt agt gct act cca gaa gat att gat tta gat cgt aag acg ggc   675
Arg Arg Ser Ala Thr Pro Glu Asp Ile Asp Leu Asp Arg Lys Thr Gly
            210                 215                 220

tta aca agt gaa ttt act gtc aat ttt ggt aca aaa aag ctc act gga   723
Leu Thr Ser Glu Phe Thr Val Asn Phe Gly Thr Lys Lys Leu Thr Gly
        225                 230                 235

gga ctt tat tat aat tta cgt gaa aca gat gct aat aaa tca caa aat   771
Gly Leu Tyr Tyr Asn Leu Arg Glu Thr Asp Ala Asn Lys Ser Gln Asn
    240                 245                 250

aga aca cat aaa ctc tac gat cta gaa gct gat gtt cat agc aac cga   819
Arg Thr His Lys Leu Tyr Asp Leu Glu Ala Asp Val His Ser Asn Arg
255                 260                 265                 270

ttc agg ggt aaa gta aag cca acc aaa aaa gag tct tct gaa gaa cat   867
Phe Arg Gly Lys Val Lys Pro Thr Lys Lys Glu Ser Ser Glu Glu His
                275                 280                 285

ccc ttt acc agc gag gga aca tta gaa ggt ggt ttt tac ggg cct gag   915
Pro Phe Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Glu
            290                 295                 300

ggt caa gaa tta gga gga aag ttt tta gct cac gac aaa aaa gtt ttg   963
Gly Gln Glu Leu Gly Gly Lys Phe Leu Ala His Asp Lys Lys Val Leu
        305                 310                 315
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ggg gta ttt agt gcc aaa gaa cag caa gaa acg tca gaa aac aaa aaa   1011
Gly Val Phe Ser Ala Lys Glu Gln Gln Glu Thr Ser Glu Asn Lys Lys
    320                 325                 330

tta ccc aaa gaa acc tta att gat ggc aag cta act act ttt aaa aca   1059
Leu Pro Lys Glu Thr Leu Ile Asp Gly Lys Leu Thr Thr Phe Lys Thr
335                 340                 345                 350

acc aat gca aca gcc aat gca aca acc gat gca aca acc agt aca aca   1107
Thr Asn Ala Thr Ala Asn Ala Thr Thr Asp Ala Thr Thr Ser Thr Thr
                355                 360                 365

gcc agt aca aaa acc gat aca aca acc aat gca aca gcc aat aca gaa   1155
Ala Ser Thr Lys Thr Asp Thr Thr Thr Asn Ala Thr Ala Asn Thr Glu
            370                 375                 380

aac ttt acg aca aaa gat ata cca agt ttg ggt gaa gct gat tat ctt   1203
Asn Phe Thr Thr Lys Asp Ile Pro Ser Leu Gly Glu Ala Asp Tyr Leu
        385                 390                 395

tta att gat aat tac cct gtt cct ctt ttc cct gag agt ggt gat ttc   1251
Leu Ile Asp Asn Tyr Pro Val Pro Leu Phe Pro Glu Ser Gly Asp Phe
    400                 405                 410

ata agt agt aag cac cat act gta gga aag aaa acc tat caa gta gaa   1299
Ile Ser Ser Lys His His Thr Val Gly Lys Lys Thr Tyr Gln Val Glu
415                 420                 425                 430

gca tgt tgc agt aat cta agc tat gta aaa ttt ggt atg tat tat gaa   1347
Ala Cys Cys Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu
                435                 440                 445

gcc cca cct aaa gaa gaa gaa aaa gaa aaa gaa aaa gac aaa gac aaa   1395
Ala Pro Pro Lys Glu Glu Glu Lys Glu Lys Glu Lys Asp Lys Asp Lys
            450                 455                 460

gaa aaa gaa aaa caa gcg aca aca tct atc aag act tat tat caa ttc   1443
Glu Lys Glu Lys Gln Ala Thr Thr Ser Ile Lys Thr Tyr Tyr Gln Phe
        465                 470                 475

tta tta ggt ctc cgt act ccc agt tct gaa ata cct aaa gaa gga agt   1491
Leu Leu Gly Leu Arg Thr Pro Ser Ser Glu Ile Pro Lys Glu Gly Ser
    480                 485                 490

gca aaa tat cat ggt aat tgg ttt ggt tat att agt gat ggc gag aca   1539
Ala Lys Tyr His Gly Asn Trp Phe Gly Tyr Ile Ser Asp Gly Glu Thr
495                 500                 505                 510

tct tac tcc gcc agt ggt gat aag gaa cgc agt aaa aat gct gtc gcc   1587
Ser Tyr Ser Ala Ser Gly Asp Lys Glu Arg Ser Lys Asn Ala Val Ala
                515                 520                 525

gag ttt aat gta aat ttt gcc gag aaa aca tta aca ggc gaa tta aaa   1635
Glu Phe Asn Val Asn Phe Ala Glu Lys Thr Leu Thr Gly Glu Leu Lys
            530                 535                 540

cga cac gat act caa aat ccc gta ttt aaa att aat gca acc ttt caa   1683
Arg His Asp Thr Gln Asn Pro Val Phe Lys Ile Asn Ala Thr Phe Gln
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        545                 550                 555

agt ggt aag aat gac ttc act ggt aca gca acc gca aaa gat tta gca   1731
Ser Gly Lys Asn Asp Phe Thr Gly Thr Ala Thr Ala Lys Asp Leu Ala
    560                 565                 570

ata gat ggt aaa aat aca caa ggc aca tct aaa gtc aat ttc acg gca   1779
Ile Asp Gly Lys Asn Thr Gln Gly Thr Ser Lys Val Asn Phe Thr Ala
575                 580                 585                 590

aca gta aac ggg gca ttt tat ggt ccg cac gct aca gaa tta ggc ggt   1827
Thr Val Asn Gly Ala Phe Tyr Gly Pro His Ala Thr Glu Leu Gly Gly
                595                 600                 605

tat ttc acc tat aac gga aac aat cct aca gat aaa aat tca tca tcc   1875
Tyr Phe Thr Tyr Asn Gly Asn Asn Pro Thr Asp Lys Asn Ser Ser Ser
            610                 615                 620

aat tca gaa aag gca aga gct gcc gtt gtg ttt gga gct aaa aaa caa   1923
Asn Ser Glu Lys Ala Arg Ala Ala Val Val Phe Gly Ala Lys Lys Gln
        625                 630                 635

caa gta gaa aca acc aa gtaatggaat actaaa a atg act aaa aaa ccc   1972
Gln Val Glu Thr Thr Lys                   Met Thr Lys Lys Pro
    640                                   645

tat ttt cgc cta agt att att tct tgt ctt tta att tca tgc tat gta   2020
Tyr Phe Arg Leu Ser Ile Ile Ser Cys Leu Leu Ile Ser Cys Tyr Val
650                 655                 660                 665

aaa gca gaa act caa agt ata aaa gat aca aaa gaa gct ata tca tct   2068
Lys Ala Glu Thr Gln Ser Ile Lys Asp Thr Lys Glu Ala Ile Ser Ser
                670                 675                 680

gaa gtg gac act caa agt aca gaa gat tca gaa tta gaa act atc tca   2116
Glu Val Asp Thr Gln Ser Thr Glu Asp Ser Glu Leu Glu Thr Ile Ser
            685                 690                 695

gtc act gca gaa aaa gtt aga gat cgt aaa gat aat gaa gta act gga   2164
Val Thr Ala Glu Lys Val Arg Asp Arg Lys Asp Asn Glu Val Thr Gly
        700                 705                 710

ctt ggc aaa att ata aaa act agt gaa agt atc agc cga gaa caa gta   2212
Leu Gly Lys Ile Ile Lys Thr Ser Glu Ser Ile Ser Arg Glu Gln Val
    715                 720                 725

tta aat att cgt gat cta aca cgc tat gat cca ggg att tca gtt gta   2260
Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro Gly Ile Ser Val Val
730                 735                 740                 745

gaa caa ggt cgc ggt gca agt tct gga tat tct att cgt ggt atg gac   2308
Glu Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ser Ile Arg Gly Met Asp
                750                 755                 760

aga aat aga gtt gct tta tta gta gat ggt tta cct caa acg caa tct   2356
Arg Asn Arg Val Ala Leu Leu Val Asp Gly Leu Pro Gln Thr Gln Ser
            765                 770                 775

tat gta gtg caa agc cct tta gtt gct cgt tca gga tat tct ggc act   2404
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Tyr Val Val Gln Ser Pro Leu Val Ala Arg Ser Gly Tyr Ser Gly Thr
        780                 785                 790

ggt gca att aat gaa att gaa tat gaa aat gta aag gcc gtc gaa ata   2452
Gly Ala Ile Asn Glu Ile Glu Tyr Glu Asn Val Lys Ala Val Glu Ile
    795                 800                 805

agc aag ggg ggg agt tct tct gag tat ggt aat gga gca cta gct ggt   2500
Ser Lys Gly Gly Ser Ser Ser Glu Tyr Gly Asn Gly Ala Leu Ala Gly
810                 815                 820                 825

tct gta aca ttt caa agc aaa tca gca gcc gat atc tta gaa gga gac   2548
Ser Val Thr Phe Gln Ser Lys Ser Ala Ala Asp Ile Leu Glu Gly Asp
                830                 835                 840

aaa tca tgg gga att caa act aaa aat gct tat tca agc aaa aat aaa   2596
Lys Ser Trp Gly Ile Gln Thr Lys Asn Ala Tyr Ser Ser Lys Asn Lys
            845                 850                 855

ggc ttt acc cat tct tta gct gta gca gga aaa caa ggt gga ttt gaa   2644
Gly Phe Thr His Ser Leu Ala Val Ala Gly Lys Gln Gly Gly Phe Glu
        860                 865                 870

ggg gtc gcc att tac act cac cga aat tca att gaa acc caa gtc cat   2692
Gly Val Ala Ile Tyr Thr His Arg Asn Ser Ile Glu Thr Gln Val His
    875                 880                 885

aaa gat gca tta aaa ggc gtg caa agt tat gat cga ttc atc gcc aca   2740
Lys Asp Ala Leu Lys Gly Val Gln Ser Tyr Asp Arg Phe Ile Ala Thr
890                 895                 900                 905

aca gag gat caa tct gca tac ttt gtg atg caa gat gag tgt cta gat   2788
Thr Glu Asp Gln Ser Ala Tyr Phe Val Met Gln Asp Glu Cys Leu Asp
                910                 915                 920

ggt tat gac aag tgt aaa act tca ccc aaa cga cct gcg act tta tcc   2836
Gly Tyr Asp Lys Cys Lys Thr Ser Pro Lys Arg Pro Ala Thr Leu Ser
            925                 930                 935

acc caa aga gaa acc gta agc gtt tca gat tat acg ggg gct aac cgt   2884
Thr Gln Arg Glu Thr Val Ser Val Ser Asp Tyr Thr Gly Ala Asn Arg
        940                 945                 950

atc aaa cct aat cca atg aaa tat gaa agc cag tct tgg ttt tta aga   2932
Ile Lys Pro Asn Pro Met Lys Tyr Glu Ser Gln Ser Trp Phe Leu Arg
    955                 960                 965

gga ggt tat cat ttt tct gaa caa cac tat att ggt ggt att ttt gaa   2980
Gly Gly Tyr His Phe Ser Glu Gln His Tyr Ile Gly Gly Ile Phe Glu
970                 975                 980                 985

ttc aca caa caa aaa ttt gat atc cgt gat atg aca ttt ccc gct tat   3028
Phe Thr Gln Gln Lys Phe Asp Ile Arg Asp Met Thr Phe Pro Ala Tyr
                990                 995                1000

tta agg cca aca gaa gac aag gat tta caa agt cgc cct ttt tat cca   3076
Leu Arg Pro Thr Glu Asp Lys Asp Leu Gln Ser Arg Pro Phe Tyr Pro
            1005                1010                1015
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aag caa gat tat ggt gca tat caa cat att ggt gat ggc aga ggc gtt   3124
Lys Gln Asp Tyr Gly Ala Tyr Gln His Ile Gly Asp Gly Arg Gly Val
       1020                1025                1030

aaa tat gca agt ggg ctt tat ttc gat gaa cac cat aga aaa cag cgt   3172
Lys Tyr Ala Ser Gly Leu Tyr Phe Asp Glu His His Arg Lys Gln Arg
   1035                1040                1045

gta ggt att gaa tat att tac gaa aat aag aac aaa gcg ggc atc att   3220
Val Gly Ile Glu Tyr Ile Tyr Glu Asn Lys Asn Lys Ala Gly Ile Ile
1050                1055                1060                1065

gac aaa gcg gtg tta agt gct aat caa caa aca tca tac ttg aca gtt   3268
Asp Lys Ala Val Leu Ser Ala Asn Gln Gln Thr Ser Tyr Leu Thr Val
                1070                1075                1080

ata tgc gac ata cgc att gca gtc ttt atc cat aat cca agt aag aat   3316
Ile Cys Asp Ile Arg Ile Ala Val Phe Ile His Asn Pro Ser Lys Asn
           1085                1090                1095

tgc cgc cca aca ctt gat aaa cct tat tca tac tat cat tct gat aga   3364
Cys Arg Pro Thr Leu Asp Lys Pro Tyr Ser Tyr Tyr His Ser Asp Arg
       1100                1105                1110

aat gtt tat aaa gaa aaa cat aac atg ttg caa ttg aat tta gag aaa   3412
Asn Val Tyr Lys Glu Lys His Asn Met Leu Gln Leu Asn Leu Glu Lys
   1115                1120                1125

aaa att caa caa aat tgg ctt act cat caa att gcc ttc aat ctt ggt   3460
Lys Ile Gln Gln Asn Trp Leu Thr His Gln Ile Ala Phe Asn Leu Gly
1130                1135                1140                1145

ttt gat gac ttt act tcc gca ctt cag cat aaa gat tat tta act cga   3508
Phe Asp Asp Phe Thr Ser Ala Leu Gln His Lys Asp Tyr Leu Thr Arg
                1150                1155                1160

cgt gtt atc gct acg gca agt agt att tca gag aaa cgt ggt gaa gca   3556
Arg Val Ile Ala Thr Ala Ser Ser Ile Ser Glu Lys Arg Gly Glu Ala
           1165                1170                1175

aga aga aat ggt tta caa tca agt cct tac tta tac cca aca cca aaa   3604
Arg Arg Asn Gly Leu Gln Ser Ser Pro Tyr Leu Tyr Pro Thr Pro Lys
       1180                1185                1190

gca gag ttg gta gga gga gat ctt tgt aat tat caa ggt aag tcc tct   3652
Ala Glu Leu Val Gly Gly Asp Leu Cys Asn Tyr Gln Gly Lys Ser Ser
   1195                1200                1205

aat tac agt gac tgt aaa gtg cgg tta att aaa ggg aaa aat tat tat   3700
Asn Tyr Ser Asp Cys Lys Val Arg Leu Ile Lys Gly Lys Asn Tyr Tyr
1210                1215                1220                1225

ttc gca gca cgc aat aat atg gca tta ggg aaa tac gtt gat tta ggt   3748
Phe Ala Ala Arg Asn Asn Met Ala Leu Gly Lys Tyr Val Asp Leu Gly
                1230                1235                1240

tta ggt atg agg tat gac gta tct cgt aca aaa gct aat gaa tca act   3796
Leu Gly Met Arg Tyr Asp Val Ser Arg Thr Lys Ala Asn Glu Ser Thr
           1245                1250                1255
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att agt gtt ggt aaa ttt aaa aat ttc tct tgg aat act ggt att gtc   3844
Ile Ser Val Gly Lys Phe Lys Asn Phe Ser Trp Asn Thr Gly Ile Val
       1260                1265                1270

ata aaa cca acg gaa tgg ctt gat ctt tct tat cgc ctt tct act gga   3892
Ile Lys Pro Thr Glu Trp Leu Asp Leu Ser Tyr Arg Leu Ser Thr Gly
   1275                1280                1285

ttt aga aat cct agt ttt gct gaa atg tat ggt tgg cgg tat ggt ggc   3940
Phe Arg Asn Pro Ser Phe Ala Glu Met Tyr Gly Trp Arg Tyr Gly Gly
1290                1295                1300                1305

aag gat acc gat gtt tat ata ggt aaa ttt aag cct gaa aca tct cgt   3988
Lys Asp Thr Asp Val Tyr Ile Gly Lys Phe Lys Pro Glu Thr Ser Arg
                1310                1315                1320

aac caa gag ttt ggt ctc gct cta aaa ggg gat ttt ggt aat att gag   4036
Asn Gln Glu Phe Gly Leu Ala Leu Lys Gly Asp Phe Gly Asn Ile Glu
           1325                1330                1335

atc agt cat ttt agt aat gct tat cga aat ctt atc gcc ttt gct gaa   4084
Ile Ser His Phe Ser Asn Ala Tyr Arg Asn Leu Ile Ala Phe Ala Glu
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gaa ctt agt aaa aat gga act act gga aag ggc aat tat gga tat cat   4132
Glu Leu Ser Lys Asn Gly Thr Thr Gly Lys Gly Asn Tyr Gly Tyr His
   1355                1360                1365

aat gca caa aat gca aaa tta gtt ggc gta aat ata act gcg caa tta   4180
Asn Ala Gln Asn Ala Lys Leu Val Gly Val Asn Ile Thr Ala Gln Leu
1370                1375                1380                1385

gat ttt aat ggt tta tgg aaa cgt att ccc tac ggt tgg tat gca aca   4228
Asp Phe Asn Gly Leu Trp Lys Arg Ile Pro Tyr Gly Trp Tyr Ala Thr
                1390                1395                1400

ttt gct tat aac cga gta aaa gtt aaa gat caa aaa atc aat gct ggt   4276
Phe Ala Tyr Asn Arg Val Lys Val Lys Asp Gln Lys Ile Asn Ala Gly
           1405                1410                1415

tta gct tcc gta agc agt tat tta ttt gat gcc att cag ccc agc cgt   4324
Leu Ala Ser Val Ser Ser Tyr Leu Phe Asp Ala Ile Gln Pro Ser Arg
       1420                1425                1430

tat atc att ggt tta ggc tat gat cat cca agt aat act tgg gga att   4372
Tyr Ile Ile Gly Leu Gly Tyr Asp His Pro Ser Asn Thr Trp Gly Ile
   1435                1440                1445

aag aca atg ttt act caa tca aaa gca aaa tct caa aat gaa ttg cta   4420
Lys Thr Met Phe Thr Gln Ser Lys Ala Lys Ser Gln Asn Glu Leu Leu
1450                1455                1460                1465

gga aaa cgt gca ttg ggt aac aat tca agg aat gta aaa tca aca aga   4468
Gly Lys Arg Ala Leu Gly Asn Asn Ser Arg Asn Val Lys Ser Thr Arg
                1470                1475                1480

aaa ctt act cgg gca tgg cat atc tta gat gta tcg ggt tat tac atg   4516
Lys Leu Thr Arg Ala Trp His Ile Leu Asp Val Ser Gly Tyr Tyr Met
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gtg aat aga agt att ttg ttc cga tta gga gta tat aat tta tta aac   4564
Val Asn Arg Ser Ile Leu Phe Arg Leu Gly Val Tyr Asn Leu Leu Asn
       1500                1505                1510

tat cgc tat gtc act tgg gaa gcg gtg cgt caa aca gca caa ggt gcg   4612
Tyr Arg Tyr Val Thr Trp Glu Ala Val Arg Gln Thr Ala Gln Gly Ala
   1515                1520                1525

gtc aat caa cat caa aat gtt ggt aac tat act cgc tac gca gca tca   4660
Val Asn Gln His Gln Asn Val Gly Asn Tyr Thr Arg Tyr Ala Ala Ser
1530                1535                1540                1545

gga cga aac tat acc tta aca tta gaa atg aaa ttc taa               4699
Gly Arg Asn Tyr Thr Leu Thr Leu Glu Met Lys Phe
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agatcaataa tgcgaattat tatcaatttt gtatgagtat ataattct atg aaa tct  177
                                                  Met Lys Ser
                                                    1

gta cct ctt atc tct ggt gga ctt tcc ttt tta cta agt gct tgt agc   225
Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser Ala Cys Ser
      5                  10                  15

gga ggg ggg tct ttt gat gta gat aac gtc tct aat acc ccc tct tct   273
Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr Pro Ser Ser
 20                  25                  30                  35

aaa cca cgt tat caa gac gat acc tcg aat caa aga aaa aaa tct aat   321
Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys Lys Ser Asn
                 40                  45                  50

ttg aaa aag ttg ttc att cct tct tta gga gga ggg atg aaa ttg gtg   369
Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met Lys Leu Val
         55                  60                  65

gct cag aat ctt cgt ggt aat aaa gaa cct agt ttc tta aat gaa gat   417
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Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu Asn Glu Asp
        70                  75                  80

gac tat ata tca tat ttt tcc tca ctt tct acg att gaa aag gat gtt   465
Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu Lys Asp Val
     85                  90                  95

aaa gat aac aat aaa aac ggg gcg gac ctt att ggc tca ata gac gag   513
Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser Ile Asp Glu
100                 105                 110                 115

cct agt aca aca aat cca ccc gaa aag cat cat gga caa aaa tat gta   561
Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln Lys Tyr Val
                120                 125                 130

tat tca ggg ctt tat tat act cca tcg tgg agt tta aac gat tct aaa   609
Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn Asp Ser Lys
            135                 140                 145

aac aag ttt tat tta ggt tac tat gga tat gcg ttt tat tat ggt aat   657
Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr Tyr Gly Asn
        150                 155                 160

aaa act gca aca aac ttg cca gta aac ggt gta gct aaa tac aaa gga   705
Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys Tyr Lys Gly
    165                 170                 175

act tgg gat ttc atc act gca act aaa aat ggc aaa cgt tat cct ttg   753
Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg Tyr Pro Leu
180                 185                 190                 195

tta agt aat ggc agt cac gct tat tat cga cgt agt gca att cca gaa   801
Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala Ile Pro Glu
                200                 205                 210

gat att gat tta gaa aat gat tca aag aat ggt gat ata ggc tta ata   849
Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile Gly Leu Ile
            215                 220                 225

agt gaa ttt agt gca gat ttt ggg act aaa aaa ctg aca gga caa ctg   897
Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr Gly Gln Leu
        230                 235                 240

tct tac acc aaa aga aaa act aat aat caa cca tat gaa aag aaa aaa   945
Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu Lys Lys Lys
    245                 250                 255

ctc tat gat ata gat gcc gat att tat agt aat aga ttc agg ggt aca   993
Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe Arg Gly Thr
260                 265                 270                 275

gta aag cca acc gaa aaa gat tct gaa gaa cat ccc ttt acc agc gag   1041
Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe Thr Ser Glu
                280                 285                 290

gga aca tta gaa ggt ggt ttt tat ggg cct aat gct gaa gaa cta ggg   1089
Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu Glu Leu Gly
            295                 300                 305
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ggg aaa ttt tta gct acg gat aac cga gtt ttt ggg gta ttt agt gcc   1137
Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val Phe Ser Ala
        310                 315                 320

aaa gaa acg gaa gaa aca aaa aag gaa gcg tta tcc aag gaa acc tta   1185
Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys Glu Thr Leu
    325                 330                 335

att gat ggc aag cta att act ttc tct act aaa aaa acc gat gca aaa   1233
Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr Asp Ala Lys
340                 345                 350                 355

acc aat gca aca acc agt acc gca gct aat aca aca acc gat aca acc   1281
Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr Asp Thr Thr
                360                 365                 370

gcc aat aca ata acc gat gaa aaa aac ttt aag acg gaa gat ata tca   1329
Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu Asp Ile Ser
            375                 380                 385

agt ttt ggt gaa gct gat tat ctg tta att gac aaa tat cct att cca   1377
Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr Pro Ile Pro
        390                 395                 400

ctt tta cct gat aaa aat act aat gat ttc ata agt agt aag cat cat   1425
Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser Lys His His
    405                 410                 415

act gta gga aat aaa cgc tat aaa gtg gaa gca tgt tgc agt aat cta   1473
Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala Cys Cys Ser Asn Leu
420                 425                 430                 435

agc tat gtg aaa ttt ggt atg tat tat gaa gac cca ctt aaa gaa aaa   1521
Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Pro Leu Lys Glu Lys
                440                 445                 450

gaa aca gaa aca gaa aca gaa aca gaa aaa gac aaa gaa aaa gaa aaa   1569
Glu Thr Glu Thr Glu Thr Glu Thr Glu Lys Asp Lys Glu Lys Glu Lys
            455                 460                 465

gaa aaa gac aaa gac aaa gaa aaa caa acg gcg gca acg acc aac act   1617
Glu Lys Asp Lys Asp Lys Glu Lys Gln Thr Ala Ala Thr Thr Asn Thr
        470                 475                 480

tat tat caa ttc tta tta ggt cac cgt act ccc aag gac gac ata cct   1665
Tyr Tyr Gln Phe Leu Leu Gly His Arg Thr Pro Lys Asp Asp Ile Pro
    485                 490                 495

aaa aca gga agt gca aaa tat cat ggt agt tgg ttt ggt tat att act   1713
Lys Thr Gly Ser Ala Lys Tyr His Gly Ser Trp Phe Gly Tyr Ile Thr
500                 505                 510                 515

gac ggt aag aca tct tac tcc ccc agt ggt gat aag aaa cgc gat aaa   1761
Asp Gly Lys Thr Ser Tyr Ser Pro Ser Gly Asp Lys Lys Arg Asp Lys
                520                 525                 530

aat gct gtc gcc gag ttt aat gtt gat ttt gcc gag aaa aag cta aca   1809
Asn Ala Val Ala Glu Phe Asn Val Asp Phe Ala Glu Lys Lys Leu Thr
            535                 540                 545
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ggc gaa tta aaa cga cac gat act gga aat ccc gta ttt agt att gag   1857
Gly Glu Leu Lys Arg His Asp Thr Gly Asn Pro Val Phe Ser Ile Glu
        550                 555                 560

gca aac ttt aat aat agt agt aat gcc ttc act ggt aca gca acc gca   1905
Ala Asn Phe Asn Asn Ser Ser Asn Ala Phe Thr Gly Thr Ala Thr Ala
    565                 570                 575

aca aat ttt gta ata gat ggt aaa aat agt caa aat aaa aat acc cca   1953
Thr Asn Phe Val Ile Asp Gly Lys Asn Ser Gln Asn Lys Asn Thr Pro
580                 585                 590                 595

att aat att aca act aaa gta aac ggg gca ttt tat gga cct aag gct   2001
Ile Asn Ile Thr Thr Lys Val Asn Gly Ala Phe Tyr Gly Pro Lys Ala
                600                 605                 610

tct gaa tta ggc ggt tat ttc act tat aac gga aat tct aca gct aca   2049
Ser Glu Leu Gly Gly Tyr Phe Thr Tyr Asn Gly Asn Ser Thr Ala Thr
            615                 620                 625

aat tct gaa agt tcc tca acc gta tct tca tca tcc aat tca aaa aat   2097
Asn Ser Glu Ser Ser Ser Thr Val Ser Ser Ser Ser Asn Ser Lys Asn
        630                 635                 640

gca aga gct gca gtt gtc ttt ggt gcg aga caa caa gta gaa aca acc   2145
Ala Arg Ala Ala Val Val Phe Gly Ala Arg Gln Gln Val Glu Thr Thr
    645                 650                 655

aaa taatggaata ctaaaa atg act aaa aaa ccc tat ttt cgc cta agt att 2197
Lys                 Met Thr Lys Lys Pro Tyr Phe Arg Leu Ser Ile
660                                 665                 670

att tct tgt ctt tta att tca tgc tat gta aaa gca gaa act caa agt   2245
Ile Ser Cys Leu Leu Ile Ser Cys Tyr Val Lys Ala Glu Thr Gln Ser
            675                 680                 685

ata aaa gat aca aaa gaa gct ata tca tct gaa gtg gac act caa agt   2293
Ile Lys Asp Thr Lys Glu Ala Ile Ser Ser Glu Val Asp Thr Gln Ser
        690                 695                 700

aca gaa gat tca gaa tta gaa act atc tca gtc act gca gaa aaa ata   2341
Thr Glu Asp Ser Glu Leu Glu Thr Ile Ser Val Thr Ala Glu Lys Ile
    705                 710                 715

aga gat cgt aaa gat aat gaa gta act gga ctt ggc aaa att atc aaa   2389
Arg Asp Arg Lys Asp Asn Glu Val Thr Gly Leu Gly Lys Ile Ile Lys
720                 725                 730                 735

act agt gaa agt atc agc cga gaa caa gta tta aat att cgt gat cta   2437
Thr Ser Glu Ser Ile Ser Arg Glu Gln Val Leu Asn Ile Arg Asp Leu
                740                 745                 750

aca cgc tat gat cca ggg att tca gtt gta gaa caa ggt cgc ggt gca   2485
Thr Arg Tyr Asp Pro Gly Ile Ser Val Val Glu Gln Gly Arg Gly Ala
            755                 760                 765

agt tct gga tat tct att cgt ggt atg gac aga aat aga gtt gct tta   2533
Ser Ser Gly Tyr Ser Ile Arg Gly Met Asp Arg Asn Arg Val Ala Leu
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        770                 775                 780

tta gta gat ggt tta cct caa acg caa tct tat gta gtg caa agc cct   2581
Leu Val Asp Gly Leu Pro Gln Thr Gln Ser Tyr Val Val Gln Ser Pro
    785                 790                 795

tta gtt gct cgt tca gga tat tct ggc act ggt gca att aat gaa att   2629
Leu Val Ala Arg Ser Gly Tyr Ser Gly Thr Gly Ala Ile Asn Glu Ile
800                 805                 810                 815

gaa tat gaa aat gta aag gcc gtc gaa ata agc aag ggg ggg agt tct   2677
Glu Tyr Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly Gly Ser Ser
                820                 825                 830

tct gag tat ggt aat gga gca cta gct ggt tct gta aca ttt caa agc   2725
Ser Glu Tyr Gly Asn Gly Ala Leu Ala Gly Ser Val Thr Phe Gln Ser
            835                 840                 845

aaa tca gca gcc gat atc tta gaa gga gac aaa tca tgg gga att caa   2773
Lys Ser Ala Ala Asp Ile Leu Glu Gly Asp Lys Ser Trp Gly Ile Gln
        850                 855                 860

act aaa aat gct tat tca agc aaa aat aaa ggc ttt acc cat tct tta   2821
Thr Lys Asn Ala Tyr Ser Ser Lys Asn Lys Gly Phe Thr His Ser Leu
    865                 870                 875

gct gta gca gga aaa caa ggt gga ttt gaa ggg cta gcc att tac act   2869
Ala Val Ala Gly Lys Gln Gly Gly Phe Glu Gly Leu Ala Ile Tyr Thr
880                 885                 890                 895

caa cga aat tca att gaa acc caa gtc cat aaa gat gca tta aaa ggc   2917
Gln Arg Asn Ser Ile Glu Thr Gln Val His Lys Asp Ala Leu Lys Gly
                900                 905                 910

gta caa agt tat gat cga tta atc gcc aca aca gat aaa tct tca gga   2965
Val Gln Ser Tyr Asp Arg Leu Ile Ala Thr Thr Asp Lys Ser Ser Gly
            915                 920                 925

tac ttt gtg ata caa ggt gag tgt cca aat ggt gat gac aag tgt gca   3013
Tyr Phe Val Ile Gln Gly Glu Cys Pro Asn Gly Asp Asp Lys Cys Ala
        930                 935                 940

gcc aag cca cct gcg act tta tcc acc caa agc gaa acc gta agc gtt   3061
Ala Lys Pro Pro Ala Thr Leu Ser Thr Gln Ser Glu Thr Val Ser Val
    945                 950                 955

tca gat tat acg ggg gct aac cgt atc aaa cct aat cca atg aaa tat   3109
Ser Asp Tyr Thr Gly Ala Asn Arg Ile Lys Pro Asn Pro Met Lys Tyr
960                 965                 970                 975

gaa agc cag tct tgg ttt tta aga gga ggg tat cat ttt tct gaa caa   3157
Glu Ser Gln Ser Trp Phe Leu Arg Gly Gly Tyr His Phe Ser Glu Gln
                980                 985                 990

cat tat att ggt ggt att ttt gaa ttc aca caa caa aaa ttt gat atc   3205
His Tyr Ile Gly Gly Ile Phe Glu Phe Thr Gln Gln Lys Phe Asp Ile
            995                1000                1005

cgt gat atg aca ttt ccc gct tat tta agc cca aca gaa aga cgg gat   3253
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Arg Asp Met Thr Phe Pro Ala Tyr Leu Ser Pro Thr Glu Arg Arg Asp
      1010                1015                1020

gat agt agt cgt tct ttt tat cca atg caa gat cat ggt gca tat caa   3301
Asp Ser Ser Arg Ser Phe Tyr Pro Met Gln Asp His Gly Ala Tyr Gln
   1025                1030                1035

cat att gag gat ggc aga ggc gtt aaa tat gca agt ggg ctt tat ttc   3349
His Ile Glu Asp Gly Arg Gly Val Lys Tyr Ala Ser Gly Leu Tyr Phe
1040                1045                1050                1055

gat gaa cac cat aga aaa cag cgt gta ggt att gaa tat att tac gaa   3397
Asp Glu His His Arg Lys Gln Arg Val Gly Ile Glu Tyr Ile Tyr Glu
               1060                1065                1070

aat aag aac aaa gcg ggc atc att gac aaa gca gtg tta agt gct aat   3445
Asn Lys Asn Lys Ala Gly Ile Ile Asp Lys Ala Val Leu Ser Ala Asn
          1075                1080                1085

caa caa aac atc ata ctt gac agt tat atg cga cat acg cat tgc agt   3493
Gln Gln Asn Ile Ile Leu Asp Ser Tyr Met Arg His Thr His Cys Ser
      1090                1095                1100

ctt tat cct aat cca agt aag aat tgc cgc cca aca ctt gat aaa cct   3541
Leu Tyr Pro Asn Pro Ser Lys Asn Cys Arg Pro Thr Leu Asp Lys Pro
   1105                1110                1115

tat tca tac tat cgt tct gat aga aat gtt tat aaa gaa aaa cat aat   3589
Tyr Ser Tyr Tyr Arg Ser Asp Arg Asn Val Tyr Lys Glu Lys His Asn
1120                1125                1130                1135

atg ttg caa ttg aat tta gag aaa aaa att caa caa aat tgg ctt act   3637
Met Leu Gln Leu Asn Leu Glu Lys Lys Ile Gln Gln Asn Trp Leu Thr
               1140                1145                1150

cat caa att gtc ttc aat ctt ggt ttt gat gac ttt act tca gcg ctt   3685
His Gln Ile Val Phe Asn Leu Gly Phe Asp Asp Phe Thr Ser Ala Leu
          1155                1160                1165

cag cat aaa gat tat tta act cga cgt gtt atc gct acg gca gat agt   3733
Gln His Lys Asp Tyr Leu Thr Arg Arg Val Ile Ala Thr Ala Asp Ser
      1170                1175                1180

att cca agg aaa cct ggt gaa act ggt aaa cca aga aat ggt ttg caa   3781
Ile Pro Arg Lys Pro Gly Glu Thr Gly Lys Pro Arg Asn Gly Leu Gln
   1185                1190                1195

tca caa cct tac tta tac cca aaa cca gag cca tat ttt gca gga caa   3829
Ser Gln Pro Tyr Leu Tyr Pro Lys Pro Glu Pro Tyr Phe Ala Gly Gln
1200                1205                1210                1215

gat cat tgt aat tat caa ggt agc tcc tct aat tac aga gac tgt aaa   3877
Asp His Cys Asn Tyr Gln Gly Ser Ser Ser Asn Tyr Arg Asp Cys Lys
               1220                1225                1230

gtg cgg tta att aaa ggg aaa aat tat tat ttc gca gca cgc aat aat   3925
Val Arg Leu Ile Lys Gly Lys Asn Tyr Tyr Phe Ala Ala Arg Asn Asn
          1235                1240                1245
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atg gca tta ggg aaa tac gtt gat tta ggt tta ggt att cgg tat gac   3973
Met Ala Leu Gly Lys Tyr Val Asp Leu Gly Leu Gly Ile Arg Tyr Asp
       1250                1255                1260

gta tct cgt aca aaa gct aat gaa tca act att agt gtt ggt aaa ttt   4021
Val Ser Arg Thr Lys Ala Asn Glu Ser Thr Ile Ser Val Gly Lys Phe
   1265                1270                1275

aaa aat ttc tct tgg aat act ggt att gtc ata aaa cca acg gaa tgg   4069
Lys Asn Phe Ser Trp Asn Thr Gly Ile Val Ile Lys Pro Thr Glu Trp
1280                1285                1290                1295

ctt gat ctt tct tat cgc ctt tct act gga ttt aga aat cct agt ttt   4117
Leu Asp Leu Ser Tyr Arg Leu Ser Thr Gly Phe Arg Asn Pro Ser Phe
               1300                1305                1310

tct gaa atg tat ggt tgg cgg tat ggt ggc aag aat gac gag gtt tat   4165
Ser Glu Met Tyr Gly Trp Arg Tyr Gly Gly Lys Asn Asp Glu Val Tyr
          1315                1320                1325

gta ggt aaa ttt aag cct gaa aca tct cgt aac caa gag ttt ggt ctc   4213
Val Gly Lys Phe Lys Pro Glu Thr Ser Arg Asn Gln Glu Phe Gly Leu
       1330                1335                1340

gct cta aaa ggg gat ttt ggt aat att gag atc agt cat ttt agt aat   4261
Ala Leu Lys Gly Asp Phe Gly Asn Ile Glu Ile Ser His Phe Ser Asn
   1345                1350                1355

gct tat cga aat ctt atc gcc ttt gct gaa gaa ctt agt aaa aat gga   4309
Ala Tyr Arg Asn Leu Ile Ala Phe Ala Glu Glu Leu Ser Lys Asn Gly
1360                1365                1370                1375

act gga aag ggc aat tat gga tat cat aat gca caa aat gca aaa tta   4357
Thr Gly Lys Gly Asn Tyr Gly Tyr His Asn Ala Gln Asn Ala Lys Leu
               1380                1385                1390

gtt ggc gta aat ata act gca caa tta gat ttt aat ggt tta tgg aaa   4405
Val Gly Val Asn Ile Thr Ala Gln Leu Asp Phe Asn Gly Leu Trp Lys
          1395                1400                1405

cgt att ccc tac ggt tgg tat gca aca ttt gct tat aac caa gta aaa   4453
Arg Ile Pro Tyr Gly Trp Tyr Ala Thr Phe Ala Tyr Asn Gln Val Lys
       1410                1415                1420

gtt aaa gat caa aaa atc aat gct ggt tta gcc tcc gta agc agt tat   4501
Val Lys Asp Gln Lys Ile Asn Ala Gly Leu Ala Ser Val Ser Ser Tyr
   1425                1430                1435

tta ttt gat gcc att cag ccc agc cgt tat atc att ggt tta ggc tat   4549
Leu Phe Asp Ala Ile Gln Pro Ser Arg Tyr Ile Ile Gly Leu Gly Tyr
1440                1445                1450                1455

gat cat cca agt aat act tgg gga att aat aca atg ttt act caa tca   4597
Asp His Pro Ser Asn Thr Trp Gly Ile Asn Thr Met Phe Thr Gln Ser
               1460                1465                1470

aaa gca aaa tct caa aat gaa ttg cta gga aaa cgt gca tta ggt aac   4645
Lys Ala Lys Ser Gln Asn Glu Leu Leu Gly Lys Arg Ala Leu Gly Asn
          1475                1480                1485
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aat tca agg gat gta aaa tca aca aga aaa ctt act cgg gca tgg cat   4693
Asn Ser Arg Asp Val Lys Ser Thr Arg Lys Leu Thr Arg Ala Trp His
       1490                1495                1500

atc tta gat gta tcg ggt tat tac atg gcg aat aaa aat att atg ctt   4741
Ile Leu Asp Val Ser Gly Tyr Tyr Met Ala Asn Lys Asn Ile Met Leu
   1505                1510                1515

cga tta ggg ata tat aat tta ttc aac tat cgc tat gtt act tgg gaa   4789
Arg Leu Gly Ile Tyr Asn Leu Phe Asn Tyr Arg Tyr Val Thr Trp Glu
1520               1525                1530                1535

gcg gtg cgt caa aca gca caa ggt gcg gtc aat caa cat caa aat gtt   4837
Ala Val Arg Gln Thr Ala Gln Gly Ala Val Asn Gln His Gln Asn Val
               1540                1545                1550

ggt agc tat act cgc tac gca gca tca gga cga aac tat acc tta aca   4885
Gly Ser Tyr Thr Arg Tyr Ala Ala Ser Gly Arg Asn Tyr Thr Leu Thr
           1555                1560                1565

tta gaa atg aaa ttc taaattaaaa tgcgccagat ggactagata tgctatatct   4940
Leu Glu Met Lys Phe
       1570

ataccttact ggcgcatctt tttctgttct ataatctgct taagtgaaaa accaaacttg 5000

gatttttttac aagatctttt cacacattta ttg                             5033
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<220>
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atg aaa tct gta cct ctt atc tct ggt gga ctt tcc ttt tta cta agt   168
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

gct tgt agc gga ggg ggg tct ttt gat gta gat aac gtc tct aat acc   216
Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

ccc tct tct aaa cca cgt tat caa gac gat acc tcg aat caa aga aaa   264
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Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

aaa tct aat ttg aaa aag ttg ttc att cct tct tta gga gga ggg atg   312
Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60

aaa ttg gtg gct cag aat ctt cgt ggt aat aaa gaa cct agt ttc tta   360
Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
 65                  70                  75                  80

aat gaa gat gac tat ata tca tat ttt tcc tca ctt tct acg att gaa   408
Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

aag gat gtt aaa gat aac aat aaa aac ggg gcg gac ctt att ggc tca   456
Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

ata gac gag cct agt aca aca aat cca ccc gaa aag cat cat gga caa   504
Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

aaa tat gta tat tca ggg ctt tat tat act cca tcg tgg agt tta aac   552
Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

gat tct aaa aac aag ttt tat tta ggt tac tat gga tat gcg ttt tat   600
Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

tat ggt aat aaa act gca aca aac ttg cca gta aac ggt gta gct aaa   648
Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

tac aaa gga act tgg gat ttc atc act gca act aaa aat ggc aaa cgt   696
Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

tat cct ttg tta agt aat ggc agt cac gct tat tat cga cgt agt gca   744
Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

att cca gaa gat att gat tta gaa aat gat tca aag aat ggt gat ata   792
Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

ggc tta ata agt gaa ttt agt gca gat ttt ggg act aaa aaa ctg aca   840
Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

gga caa ctg tct tac acc aaa aga aaa act aat aat caa cca tat gaa   888
Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

aag aaa aaa ctc tat gat ata gat gcc gat att tat agt aat aga ttc   936
Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270
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agg ggt aca gta aag cca acc gaa aaa gat tct gaa gaa cat ccc ttt   984
Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

acc agc gag gga aca tta gaa ggt ggt ttt tat ggg cct aat gct gaa  1032
Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

gaa cta ggg ggg aaa ttt tta gct acg gat aac cga gtt ttt ggg gta  1080
Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

ttt agt gcc aaa gaa acg gaa gaa aca aaa aag gaa gcg tta tcc aag  1128
Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

gaa acc tta att gat ggc aag cta att act ttc tct act aaa aaa acc  1176
Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

gat gca aaa acc aat gca aca acc agt acc gca gct aat aca aca acc  1224
Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

gat aca acc gcc aat aca ata acc gat gaa aaa aac ttt aag acg gaa  1272
Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

gat ata tca agt ttt ggt gaa gct gat tat ctg tta att gac aaa tat  1320
Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

cct att cca ctt tta cct gat aaa aat act aat gat ttc ata agt agt  1368
Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser
                405                 410                 415

aag cat cat act gta gga aat aaa cgc tat aaa gtg gaa gca tgt tgc  1416
Lys His His Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala Cys Cys
            420                 425                 430

agt aat cta agc tat gtg aaa ttt ggt atg tat tat gaa gac cca ctt  1464
Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Pro Leu
        435                 440                 445

aaa gaa aaa gaa aca gaa aca gaa aca gaa aca gaa aca gaa aaa gac aaa gaa  1512
Lys Glu Lys Glu Thr Glu Thr Glu Thr Glu Thr Glu Thr Glu Lys Asp Lys Glu
    450                 455                 460

aaa gaa aaa gaa aaa gac aaa gac aaa gaa aaa caa acg gcg gca acg  1560
Lys Glu Lys Glu Lys Asp Lys Asp Lys Glu Lys Gln Thr Ala Ala Thr
465                 470                 475                 480

acc aac act tat tat caa ttc tta tta ggt cac cgt act ccc aag gac  1608
Thr Asn Thr Tyr Tyr Gln Phe Leu Leu Gly His Arg Thr Pro Lys Asp
                485                 490                 495

gac ata cct aaa aca gga agt gca aaa tat cat ggt agt tgg ttt ggt  1656
Asp Ile Pro Lys Thr Gly Ser Ala Lys Tyr His Gly Ser Trp Phe Gly
            500                 505                 510
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tat att act gac ggt aag aca tct tac tcc ccc agt ggt gat aag aaa   1704
Tyr Ile Thr Asp Gly Lys Thr Ser Tyr Ser Pro Ser Gly Asp Lys Lys
        515                 520                 525

cgc gat aaa aat gct gtc gcc gag ttt aat gtt gat ttt gcc gag aaa   1752
Arg Asp Lys Asn Ala Val Ala Glu Phe Asn Val Asp Phe Ala Glu Lys
    530                 535                 540

aag cta aca ggc gaa tta aaa cga cac gat act gga aat ccc gta ttt   1800
Lys Leu Thr Gly Glu Leu Lys Arg His Asp Thr Gly Asn Pro Val Phe
545                 550                 555                 560

agt att gag gca aac ttt aat aat agt agt aat gcc ttc act ggt aca   1848
Ser Ile Glu Ala Asn Phe Asn Asn Ser Ser Asn Ala Phe Thr Gly Thr
                565                 570                 575

gca acc gca aca aat ttt gta ata gat ggt aaa aat agt caa aat aaa   1896
Ala Thr Ala Thr Asn Phe Val Ile Asp Gly Lys Asn Ser Gln Asn Lys
            580                 585                 590

aat acc cca att aat att aca act aaa gta aac ggg gca ttt tat gga   1944
Asn Thr Pro Ile Asn Ile Thr Thr Lys Val Asn Gly Ala Phe Tyr Gly
        595                 600                 605

cct aag gct tct gaa tta ggc ggt tat ttc act tat aac gga aat tct   1992
Pro Lys Ala Ser Glu Leu Gly Gly Tyr Phe Thr Tyr Asn Gly Asn Ser
    610                 615                 620

aca gct aca aat tct gaa agt tcc tca acc gta tct tca tca tcc aat   2040
Thr Ala Thr Asn Ser Glu Ser Ser Ser Thr Val Ser Ser Ser Ser Asn
625                 630                 635                 640

tca aaa aat gca aga gct gca gtt gtc ttt ggt gcg aga caa caa gta   2088
Ser Lys Asn Ala Arg Ala Ala Val Val Phe Gly Ala Arg Gln Gln Val
                645                 650                 655

gaa aca acc aaa taatggaata ctaaaa atg act aaa aaa ccc tat ttt cgc 2140
Glu Thr Thr Lys                     Met Thr Lys Lys Pro Tyr Phe Arg
            660                                 665

cta agt att att tct tgt ctt tta att tca tgc tat gta aaa gca gaa   2188
Leu Ser Ile Ile Ser Cys Leu Leu Ile Ser Cys Tyr Val Lys Ala Glu
    670                 675                 680

act caa agt ata aaa gat aca aaa gaa gct ata tca tct gaa gtg gac   2236
Thr Gln Ser Ile Lys Asp Thr Lys Glu Ala Ile Ser Ser Glu Val Asp
685                 690                 695                 700

act caa agt aca gaa gat tca gaa tta gaa act atc tca gtc act gca   2284
Thr Gln Ser Thr Glu Asp Ser Glu Leu Glu Thr Ile Ser Val Thr Ala
                705                 710                 715

gaa aaa ata aga gat cgt aaa gat aat gaa gta act gga ctt ggc aaa   2332
Glu Lys Ile Arg Asp Arg Lys Asp Asn Glu Val Thr Gly Leu Gly Lys
            720                 725                 730

att atc aaa act agt gaa agt atc agc cga gaa caa gta tta aat att   2380
Ile Ile Lys Thr Ser Glu Ser Ile Ser Arg Glu Gln Val Leu Asn Ile
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        735                 740                 745

cgt gat cta aca cgc tat gat cca ggg att tca gtt gta gaa caa ggt   2428
Arg Asp Leu Thr Arg Tyr Asp Pro Gly Ile Ser Val Val Glu Gln Gly
    750                 755                 760

cgc ggt gca agt tct gga tat tct att cgt ggt atg gac aga aat aga   2476
Arg Gly Ala Ser Ser Gly Tyr Ser Ile Arg Gly Met Asp Arg Asn Arg
765                 770                 775                 780

gtt gct tta tta gta gat ggt tta cct caa acg caa tct tat gta gtg   2524
Val Ala Leu Leu Val Asp Gly Leu Pro Gln Thr Gln Ser Tyr Val Val
            785                 790                 795

caa agc cct tta gtt gct cgt tca gga tat tct ggc act ggt gca att   2572
Gln Ser Pro Leu Val Ala Arg Ser Gly Tyr Ser Gly Thr Gly Ala Ile
        800                 805                 810

aat gaa att gaa tat gaa aat gta aag gcc gtc gaa ata agc aag ggg   2620
Asn Glu Ile Glu Tyr Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly
    815                 820                 825

ggg agt tct tct gag tat ggt aat gga gca cta gct ggt tct gta aca   2668
Gly Ser Ser Ser Glu Tyr Gly Asn Gly Ala Leu Ala Gly Ser Val Thr
830                 835                 840

ttt caa agc aaa tca gca gcc gat atc tta gaa gga gac aaa tca tgg   2716
Phe Gln Ser Lys Ser Ala Ala Asp Ile Leu Glu Gly Asp Lys Ser Trp
845                 850                 855                 860

gga att caa act aaa aat gct tat tca agc aaa aat aaa ggc ttt acc   2764
Gly Ile Gln Thr Lys Asn Ala Tyr Ser Ser Lys Asn Lys Gly Phe Thr
            865                 870                 875

cat tct tta gct gta gca gga aaa caa ggt gga ttt gaa ggg cta gcc   2812
His Ser Leu Ala Val Ala Gly Lys Gln Gly Gly Phe Glu Gly Leu Ala
        880                 885                 890

att tac act caa cga aat tca att gaa acc caa gtc cat aaa gat gca   2860
Ile Tyr Thr Gln Arg Asn Ser Ile Glu Thr Gln Val His Lys Asp Ala
    895                 900                 905

tta aaa ggc gta caa agt tat gat cga tta atc gcc aca aca gat aaa   2908
Leu Lys Gly Val Gln Ser Tyr Asp Arg Leu Ile Ala Thr Thr Asp Lys
910                 915                 920

tct tca gga tac ttt gtg ata caa ggt gag tgt cca aat ggt gat gac   2956
Ser Ser Gly Tyr Phe Val Ile Gln Gly Glu Cys Pro Asn Gly Asp Asp
925                 930                 935                 940

aag tgt gca gcc aag cca cct gcg act tta tcc acc caa agc gaa acc   3004
Lys Cys Ala Ala Lys Pro Pro Ala Thr Leu Ser Thr Gln Ser Glu Thr
            945                 950                 955

gta agc gtt tca gat tat acg ggg gct aac cgt atc aaa cct aat cca   3052
Val Ser Val Ser Asp Tyr Thr Gly Ala Asn Arg Ile Lys Pro Asn Pro
        960                 965                 970

atg aaa tat gaa agc cag tct tgg ttt tta aga gga ggg tat cat ttt   3100
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Met Lys Tyr Glu Ser Gln Ser Trp Phe Leu Arg Gly Gly Tyr His Phe
        975                 980                 985

tct gaa caa cat tat att ggt ggt att ttt gaa ttc aca caa caa aaa   3148
Ser Glu Gln His Tyr Ile Gly Gly Ile Phe Glu Phe Thr Gln Gln Lys
    990                 995                1000

ttt gat atc cgt gat atg aca ttt ccc gct tat tta agc cca aca gaa   3196
Phe Asp Ile Arg Asp Met Thr Phe Pro Ala Tyr Leu Ser Pro Thr Glu
1005                1010                1015                1020

aga cgg gat gat agt agt cgt tct ttt tat cca atg caa gat cat ggt   3244
Arg Arg Asp Asp Ser Ser Arg Ser Phe Tyr Pro Met Gln Asp His Gly
               1025                1030                1035

gca tat caa cat att gag gat ggc aga ggc gtt aaa tat gca agt ggg   3292
Ala Tyr Gln His Ile Glu Asp Gly Arg Gly Val Lys Tyr Ala Ser Gly
           1040                1045                1050

ctt tat ttc gat gaa cac cat aga aaa cag cgt gta ggt att gaa tat   3340
Leu Tyr Phe Asp Glu His His Arg Lys Gln Arg Val Gly Ile Glu Tyr
       1055                1060                1065

att tac gaa aat aag aac aaa gcg ggc atc att gac aaa gca gtg tta   3388
Ile Tyr Glu Asn Lys Asn Lys Ala Gly Ile Ile Asp Lys Ala Val Leu
   1070                1075                1080

agt gct aat caa caa aac atc ata ctt gac agt tat atg cga cat acg   3436
Ser Ala Asn Gln Gln Asn Ile Ile Leu Asp Ser Tyr Met Arg His Thr
1085                1090                1095                1100

cat tgc agt ctt tat cct aat cca agt aag aat tgc cgc cca aca ctt   3484
His Cys Ser Leu Tyr Pro Asn Pro Ser Lys Asn Cys Arg Pro Thr Leu
               1105                1110                1115

gat aaa cct tat tca tac tat cgt tct gat aga aat gtt tat aaa gaa   3532
Asp Lys Pro Tyr Ser Tyr Tyr Arg Ser Asp Arg Asn Val Tyr Lys Glu
           1120                1125                1130

aaa cat aat atg ttg caa ttg aat tta gag aaa aaa att caa caa aat   3580
Lys His Asn Met Leu Gln Leu Asn Leu Glu Lys Lys Ile Gln Gln Asn
       1135                1140                1145

tgg ctt act cat caa att gtc ttc aat ctt ggt ttt gat gac ttt act   3628
Trp Leu Thr His Gln Ile Val Phe Asn Leu Gly Phe Asp Asp Phe Thr
   1150                1155                1160

tca gcg ctt cag cat aaa gat tat tta act cga cgt gtt atc gct acg   3676
Ser Ala Leu Gln His Lys Asp Tyr Leu Thr Arg Arg Val Ile Ala Thr
1165                1170                1175                1180

gca gat agt att cca agg aaa cct ggt gaa act ggt aaa cca aga aat   3724
Ala Asp Ser Ile Pro Arg Lys Pro Gly Glu Thr Gly Lys Pro Arg Asn
               1185                1190                1195

ggt ttg caa tca caa cct tac tta tac cca aaa cca gag cca tat ttt   3772
Gly Leu Gln Ser Gln Pro Tyr Leu Tyr Pro Lys Pro Glu Pro Tyr Phe
           1200                1205                1210
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gca gga caa gat cat tgt aat tat caa ggt agc tcc tct aat tac aga   3820
Ala Gly Gln Asp His Cys Asn Tyr Gln Gly Ser Ser Ser Asn Tyr Arg
       1215                1220                1225

gac tgt aaa gtg cgg tta att aaa ggg aaa aat tat tat ttc gca gca   3868
Asp Cys Lys Val Arg Leu Ile Lys Gly Lys Asn Tyr Tyr Phe Ala Ala
   1230                1235                1240

cgc aat aat atg gca tta ggg aaa tac gtt gat tta ggt tta ggt att   3916
Arg Asn Asn Met Ala Leu Gly Lys Tyr Val Asp Leu Gly Leu Gly Ile
1245                1250                1255                1260

cgg tat gac gta tct cgt aca aaa gct aat gaa tca act att agt gtt   3964
Arg Tyr Asp Val Ser Arg Thr Lys Ala Asn Glu Ser Thr Ile Ser Val
               1265                1270                1275

ggt aaa ttt aaa aat ttc tct tgg aat act ggt att gtc ata aaa cca   4012
Gly Lys Phe Lys Asn Phe Ser Trp Asn Thr Gly Ile Val Ile Lys Pro
          1280                1285                1290

acg gaa tgg ctt gat ctt tct tat cgc ctt tct act gga ttt aga aat   4060
Thr Glu Trp Leu Asp Leu Ser Tyr Arg Leu Ser Thr Gly Phe Arg Asn
       1295                1300                1305

cct agt ttt tct gaa atg tat ggt tgg cgg tat ggt ggc aag aat gac   4108
Pro Ser Phe Ser Glu Met Tyr Gly Trp Arg Tyr Gly Gly Lys Asn Asp
   1310                1315                1320

gag gtt tat gta ggt aaa ttt aag cct gaa aca tct cgt aac caa gag   4156
Glu Val Tyr Val Gly Lys Phe Lys Pro Glu Thr Ser Arg Asn Gln Glu
1325                1330                1335                1340

ttt ggt ctc gct cta aaa ggg gat ttt ggt aat att gag atc agt cat   4204
Phe Gly Leu Ala Leu Lys Gly Asp Phe Gly Asn Ile Glu Ile Ser His
               1345                1350                1355

ttt agt aat gct tat cga aat ctt atc gcc ttt gct gaa gaa ctt agt   4252
Phe Ser Asn Ala Tyr Arg Asn Leu Ile Ala Phe Ala Glu Glu Leu Ser
          1360                1365                1370

aaa aat gga act gga aag ggc aat tat gga tat cat aat gca caa aat   4300
Lys Asn Gly Thr Gly Lys Gly Asn Tyr Gly Tyr His Asn Ala Gln Asn
       1375                1380                1385

gca aaa tta gtt ggc gta aat ata act gca caa tta gat ttt aat ggt   4348
Ala Lys Leu Val Gly Val Asn Ile Thr Ala Gln Leu Asp Phe Asn Gly
   1390                1395                1400

tta tgg aaa cgt att ccc tac ggt tgg tat gca aca ttt gct tat aac   4396
Leu Trp Lys Arg Ile Pro Tyr Gly Trp Tyr Ala Thr Phe Ala Tyr Asn
1405                1410                1415                1420

caa gta aaa gtt aaa gat caa aaa atc aat gct ggt tta gcc tcc gta   4444
Gln Val Lys Val Lys Asp Gln Lys Ile Asn Ala Gly Leu Ala Ser Val
               1425                1430                1435

agc agt tat tta ttt gat gcc att cag ccc agc cgt tat atc att ggt   4492
Ser Ser Tyr Leu Phe Asp Ala Ile Gln Pro Ser Arg Tyr Ile Ile Gly
          1440                1445                1450
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tta ggc tat gat cat cca agt aat act tgg gga att aat aca atg ttt   4540
Leu Gly Tyr Asp His Pro Ser Asn Thr Trp Gly Ile Asn Thr Met Phe
       1455                1460                1465

act caa tca aaa gca aaa tct caa aat gaa ttg cta gga aaa cgt gca   4588
Thr Gln Ser Lys Ala Lys Ser Gln Asn Glu Leu Leu Gly Lys Arg Ala
   1470                1475                1480

tta ggt aac aat tca agg gat gta aaa tca aca aga aaa ctt act cgg   4636
Leu Gly Asn Asn Ser Arg Asp Val Lys Ser Thr Arg Lys Leu Thr Arg
1485                1490                1495                1500

gca tgg cat atc tta gat gta tcg ggt tat tac atg gcg aat aaa aat   4684
Ala Trp His Ile Leu Asp Val Ser Gly Tyr Tyr Met Ala Asn Lys Asn
               1505                1510                1515

att atg ctt cga tta ggg ata tat aat tta ttc aac tat cgc tat gtt   4732
Ile Met Leu Arg Leu Gly Ile Tyr Asn Leu Phe Asn Tyr Arg Tyr Val
           1520                1525                1530

act tgg gaa gcg gtg cgt caa aca gca caa ggt gcg gtc aat caa cat   4780
Thr Trp Glu Ala Val Arg Gln Thr Ala Gln Gly Ala Val Asn Gln His
       1535                1540                1545

caa aat gtt ggt agc tat act cgc tac gca gca tca gga cga aac tat   4828
Gln Asn Val Gly Ser Tyr Thr Arg Tyr Ala Ala Ser Gly Arg Asn Tyr
   1550                1555                1560

acc tta aca tta gaa atg aaa ttc taaattaaaa tgcgccagat ggactagata  4882
Thr Leu Thr Leu Glu Met Lys Phe
1565                1570

tgctatatct ataccttact ggcgcatctt tttctgttct ataatctgct taagtgaaaa 4942

accaaacttg gatttttttac aagatctttt cacacattta ttgtaaaatc tccgacaatt 5002

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aatgcgaatt attatcaatt ttgtataagt attaattct atg aaa tct gta cct    174
                                          Met Lys Ser Val Pro
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ctt atc act ggt gga ctt tcc ttt tta cta agc gct tgt agc ggg gga    222
Leu Ile Thr Gly Gly Leu Ser Phe Leu Leu Ser Ala Cys Ser Gly Gly
                  10                  15                  20

ggt ggt tct ttt gat gta gat gac gtc tct aat ccc tcc tct tct aaa    270
Gly Gly Ser Phe Asp Val Asp Asp Val Ser Asn Pro Ser Ser Ser Lys
              25                  30                  35

cca cgt tat caa gac gat acc tcg aat caa aga aca aaa tct gat ttg    318
Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Thr Lys Ser Asp Leu
          40                  45                  50

gaa aag ttg ttc att cct tct tta ggg gga ggg atg aag tta gtg gct    366
Glu Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met Lys Leu Val Ala
      55                  60                  65

caa aat ttt att ggt gct aga gaa cct agt ttc tta aat gaa gat ggc    414
Gln Asn Phe Ile Gly Ala Arg Glu Pro Ser Phe Leu Asn Glu Asp Gly
  70                  75                  80                  85

tat atg ata ttt tcc tca ctt tct acg att gaa gag gat gtt gaa aaa    462
Tyr Met Ile Phe Ser Ser Leu Ser Thr Ile Glu Glu Asp Val Glu Lys
                  90                  95                 100

gtt aaa aat aac aat aaa aac ggg ggg agg ctt att ggc tca att gag    510
Val Lys Asn Asn Asn Lys Asn Gly Gly Arg Leu Ile Gly Ser Ile Glu
             105                 110                 115

gaa cct aat gga aca tca caa aat tct aat tca caa gaa tac gtt tat    558
Glu Pro Asn Gly Thr Ser Gln Asn Ser Asn Ser Gln Glu Tyr Val Tyr
         120                 125                 130

tct ggt ttg tat tat atc gat agt tgg cgt gat tat aag aag gaa gag    606
Ser Gly Leu Tyr Tyr Ile Asp Ser Trp Arg Asp Tyr Lys Lys Glu Glu
     135                 140                 145

caa aaa gct tat act ggc tat tat ggt tat gca ttt tat tat ggt aat    654
Gln Lys Ala Tyr Thr Gly Tyr Tyr Gly Tyr Ala Phe Tyr Tyr Gly Asn
150                 155                 160                 165

gaa act gca aaa aac ttg cca gta aaa ggt gta gct aaa tac aaa gga    702
Glu Thr Ala Lys Asn Leu Pro Val Lys Gly Val Ala Lys Tyr Lys Gly
                 170                 175                 180

acg tgg aac ttc atc act gca act gaa aat ggc aaa cgt tat tct ttg    750
Thr Trp Asn Phe Ile Thr Ala Thr Glu Asn Gly Lys Arg Tyr Ser Leu
             185                 190                 195

ttc agt aat tct atc ggt caa gct tat tcc aga cgc agc gct att tca    798
Phe Ser Asn Ser Ile Gly Gln Ala Tyr Ser Arg Arg Ser Ala Ile Ser
         200                 205                 210

gaa gat atc tat aat tta gaa aac ggt gac gcg ggc tta ata agt gaa    846
Glu Asp Ile Tyr Asn Leu Glu Asn Gly Asp Ala Gly Leu Ile Ser Glu
     215                 220                 225
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ttt agt gta gat ttt ggt aag aaa gag ctc act gga gaa ctt tat tat   894
Phe Ser Val Asp Phe Gly Lys Lys Glu Leu Thr Gly Glu Leu Tyr Tyr
230                 235                 240                 245

aat gaa agg aaa aca agt gtt aat gaa tca caa aat aca aca cat aaa   942
Asn Glu Arg Lys Thr Ser Val Asn Glu Ser Gln Asn Thr Thr His Lys
                250                 255                 260

ctc tac act cta gaa gct aaa gtg tat agc aac cga ttc aga ggt aaa   990
Leu Tyr Thr Leu Glu Ala Lys Val Tyr Ser Asn Arg Phe Arg Gly Lys
            265                 270                 275

gta aag cca acc aaa aca aag tct gaa gat cat ccc ttt acc agc gag   1038
Val Lys Pro Thr Lys Thr Lys Ser Glu Asp His Pro Phe Thr Ser Glu
        280                 285                 290

gga aca tta gaa ggt ggt ttt tat ggg cct aat gct gaa gaa cta ggg   1086
Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu Glu Leu Gly
    295                 300                 305

gga aag ttt tta gct aac gac gaa aaa gtt ttt ggg gta ttt agt gcc   1134
Gly Lys Phe Leu Ala Asn Asp Glu Lys Val Phe Gly Val Phe Ser Ala
310                 315                 320                 325

aaa gaa gac cca caa aac cca gaa aac caa aaa tta tcc aca gaa acc   1182
Lys Glu Asp Pro Gln Asn Pro Glu Asn Gln Lys Leu Ser Thr Glu Thr
                330                 335                 340

tta att gat ggc aag cta att act ttt aaa aga act gat gca aca acc   1230
Leu Ile Asp Gly Lys Leu Ile Thr Phe Lys Arg Thr Asp Ala Thr Thr
            345                 350                 355

aat gca aca acc gat gca aaa acc agt gca aca acc gat gca acc agt   1278
Asn Ala Thr Thr Asp Ala Lys Thr Ser Ala Thr Thr Asp Ala Thr Ser
        360                 365                 370

aca aca gcc aat aaa aaa acc gat gca gaa aac ttt aag acg gaa gat   1326
Thr Thr Ala Asn Lys Lys Thr Asp Ala Glu Asn Phe Lys Thr Glu Asp
    375                 380                 385

ata cca agt ttt ggt gaa gct gat tac ctt tta att ggc aat cag cct   1374
Ile Pro Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Gly Asn Gln Pro
390                 395                 400                 405

att cct ctt tta cct gaa aaa aat act gat gat ttc ata agt agt aag   1422
Ile Pro Leu Leu Pro Glu Lys Asn Thr Asp Asp Phe Ile Ser Ser Lys
                410                 415                 420

cac cat acg gta gga ggt aaa acc tat aaa gta gaa gca tgt tgc aag   1470
His His Thr Val Gly Gly Lys Thr Tyr Lys Val Glu Ala Cys Cys Lys
            425                 430                 435

aat cta agc tat gtg aaa ttt ggt atg tat tat gag gat aaa gat aag   1518
Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Lys Asp Lys
        440                 445                 450

gac aac aaa aat gaa aca gac aaa gaa aaa ggc aaa gaa aaa cca acg   1566
Asp Asn Lys Asn Glu Thr Asp Lys Glu Lys Gly Lys Glu Lys Pro Thr
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    455                 460                 465

acg aca aca tct atc aac act tat tat caa ttc tta tta ggt ctc cgt   1614
Thr Thr Thr Ser Ile Asn Thr Tyr Tyr Gln Phe Leu Leu Gly Leu Arg
470                 475                 480                 485

act ccc aag gac gaa ata cct aaa gaa gga agt gca aaa tat cat ggt   1662
Thr Pro Lys Asp Glu Ile Pro Lys Glu Gly Ser Ala Lys Tyr His Gly
            490                 495                 500

aat tgg ttt ggt tat att agt gat ggc gag aca tct tac tcc gcc agt   1710
Asn Trp Phe Gly Tyr Ile Ser Asp Gly Glu Thr Ser Tyr Ser Ala Ser
        505                 510                 515

ggt gat aag gaa cgc agt aaa aat gct gtc gcc gag ttt gat gta agt   1758
Gly Asp Lys Glu Arg Ser Lys Asn Ala Val Ala Glu Phe Asp Val Ser
    520                 525                 530

ttt gcc aat aaa aca tta aca ggc gaa tta aaa cga cac gat aat gga   1806
Phe Ala Asn Lys Thr Leu Thr Gly Glu Leu Lys Arg His Asp Asn Gly
535                 540                 545

aat acc gta ttt aaa att aat gca gaa tta aat ggt agt aat gac ttc   1854
Asn Thr Val Phe Lys Ile Asn Ala Glu Leu Asn Gly Ser Asn Asp Phe
550                 555                 560                 565

act ggt aca gca acc gca aca aat ttt gta ata gat ggt aac aat agt   1902
Thr Gly Thr Ala Thr Ala Thr Asn Phe Val Ile Asp Gly Asn Asn Ser
            570                 575                 580

caa act tca aat gcc aaa att aat att aca act aaa gta aat ggg gca   1950
Gln Thr Ser Asn Ala Lys Ile Asn Ile Thr Thr Lys Val Asn Gly Ala
        585                 590                 595

ttt tat gga cct aag gct tct gaa tta gga ggg tat ttc acc tat aac   1998
Phe Tyr Gly Pro Lys Ala Ser Glu Leu Gly Gly Tyr Phe Thr Tyr Asn
    600                 605                 610

gga aaa aat cct aca gct aca aat tct gaa agt tcc tca acc gta cct   2046
Gly Lys Asn Pro Thr Ala Thr Asn Ser Glu Ser Ser Ser Thr Val Pro
615                 620                 625

tca cca ccc aat tca cca aat gca agc gct gca gtt gtc ttt ggt gct   2094
Ser Pro Pro Asn Ser Pro Asn Ala Ser Ala Ala Val Val Phe Gly Ala
630                 635                 640                 645

aaa aaa caa gta gaa aca acc aac aag taaaaacaac caagtaatgg         2141
Lys Lys Gln Val Glu Thr Thr Asn Lys
            650

aatactaaaa atg act aaa aaa ccc tat ttt cgc cta agt att att tct   2190
          Met Thr Lys Lys Pro Tyr Phe Arg Leu Ser Ile Ile Ser
        655                 660                 665

tgt ctt tta att tca tgc tat gta aaa gca gaa act caa agt ata aaa   2238
Cys Leu Leu Ile Ser Cys Tyr Val Lys Ala Glu Thr Gln Ser Ile Lys
    670                 675                 680

gat aca aaa gaa gct ata tca tct gaa gtg gac act caa agt aca gaa   2286
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Asp Thr Lys Glu Ala Ile Ser Ser Glu Val Asp Thr Gln Ser Thr Glu
    685                 690                 695

gat tca gaa tta gaa act atc tca gtc act gca gaa aaa ata aga gat   2334
Asp Ser Glu Leu Glu Thr Ile Ser Val Thr Ala Glu Lys Ile Arg Asp
700                 705                 710                 715

cgt aaa gat aat gaa gta act gga ctt ggc aaa att atc aaa act agt   2382
Arg Lys Asp Asn Glu Val Thr Gly Leu Gly Lys Ile Ile Lys Thr Ser
                720                 725                 730

gaa agt atc agc cga gaa caa gta tta aat att cgt gat cta aca cgc   2430
Glu Ser Ile Ser Arg Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg
            735                 740                 745

tat gat cca ggc att tca gtt gta gaa caa ggc cgt ggt gca agt tct   2478
Tyr Asp Pro Gly Ile Ser Val Val Glu Gln Gly Arg Gly Ala Ser Ser
        750                 755                 760

gga tat tct att cgt ggt atg gac aga aat aga gtt gct tta tta gta   2526
Gly Tyr Ser Ile Arg Gly Met Asp Arg Asn Arg Val Ala Leu Leu Val
    765                 770                 775

gat ggt tta cct caa acg caa tct tat gta gtg caa agc cct tta gtt   2574
Asp Gly Leu Pro Gln Thr Gln Ser Tyr Val Val Gln Ser Pro Leu Val
780                 785                 790                 795

gct cgt tca gga tat tct ggc act ggt gca att aat gaa att gaa tat   2622
Ala Arg Ser Gly Tyr Ser Gly Thr Gly Ala Ile Asn Glu Ile Glu Tyr
                800                 805                 810

gaa aat gta aag gcc gtc gaa ata agc aag ggg ggg agt tct tct gag   2670
Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly Gly Ser Ser Ser Glu
            815                 820                 825

tat ggt aat gga gca cta gct ggt tct gta aca ttt caa agc aaa tca   2718
Tyr Gly Asn Gly Ala Leu Ala Gly Ser Val Thr Phe Gln Ser Lys Ser
        830                 835                 840

gca gcc gat atc tta gaa gga gac aaa tca tgg gga att caa act aaa   2766
Ala Ala Asp Ile Leu Glu Gly Asp Lys Ser Trp Gly Ile Gln Thr Lys
    845                 850                 855

aat gct tat tca agc aaa aat aaa ggc ttt acc cat tct tta gct gta   2814
Asn Ala Tyr Ser Ser Lys Asn Lys Gly Phe Thr His Ser Leu Ala Val
860                 865                 870                 875

gct gga aaa caa ggg gga ttt gac ggg gtc gcc att tat act caa cga   2862
Ala Gly Lys Gln Gly Gly Phe Asp Gly Val Ala Ile Tyr Thr Gln Arg
                880                 885                 890

aat tca att gaa acc caa gtc cat aaa gat gca tta aaa ggc gta caa   2910
Asn Ser Ile Glu Thr Gln Val His Lys Asp Ala Leu Lys Gly Val Gln
            895                 900                 905

agt tat cat cga tta atc gcc aaa cca gag gat caa tct gca tac ttt   2958
Ser Tyr His Arg Leu Ile Ala Lys Pro Glu Asp Gln Ser Ala Tyr Phe
        910                 915                 920
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gtg atg caa gat gag tgt cca aag cca gat gat tat aac agt tgt tta   3006
Val Met Gln Asp Glu Cys Pro Lys Pro Asp Asp Tyr Asn Ser Cys Leu
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cct ttc gcc aaa cga cct gcg att tta tcc tcc caa aga gaa acc gta   3054
Pro Phe Ala Lys Arg Pro Ala Ile Leu Ser Ser Gln Arg Glu Thr Val
940                 945                 950                 955

agc gtt tca gat tat acg ggg gct aac cgt atc aaa cct aat cca atg   3102
Ser Val Ser Asp Tyr Thr Gly Ala Asn Arg Ile Lys Pro Asn Pro Met
                960                 965                 970

aaa tat gaa agc cag tct tgg ttt tta aga gga ggg tat cat ttt tct   3150
Lys Tyr Glu Ser Gln Ser Trp Phe Leu Arg Gly Gly Tyr His Phe Ser
            975                 980                 985

gaa caa cat tat att ggt ggt att ttt gaa ttc aca caa caa aaa ttt   3198
Glu Gln His Tyr Ile Gly Gly Ile Phe Glu Phe Thr Gln Gln Lys Phe
        990                 995                1000

gat atc cgt gat atg aca ttt ccc gct tat tta aga tca aca gaa aaa   3246
Asp Ile Arg Asp Met Thr Phe Pro Ala Tyr Leu Arg Ser Thr Glu Lys
   1005                1010                1015

cgg gat gat agc agt ggc tct ttt tat cca aag caa gat tat ggt gca   3294
Arg Asp Asp Ser Ser Gly Ser Phe Tyr Pro Lys Gln Asp Tyr Gly Ala
1020                1025                1030                1035

tat caa cgt att gag gat ggc cga ggc gtt aac tat gca agt ggg ctt   3342
Tyr Gln Arg Ile Glu Asp Gly Arg Gly Val Asn Tyr Ala Ser Gly Leu
                1040                1045                1050

tat ttc gat gaa cac cat aga aaa cag cgt gta ggt att gaa tat att   3390
Tyr Phe Asp Glu His His Arg Lys Gln Arg Val Gly Ile Glu Tyr Ile
            1055                1060                1065

tac gaa aat aag aac aaa gcg ggc atc att gac aaa gca gtg tta agt   3438
Tyr Glu Asn Lys Asn Lys Ala Gly Ile Ile Asp Lys Ala Val Leu Ser
        1070                1075                1080

gct aat caa caa aac atc ata ctt gac agt tat atg caa cat acg cat   3486
Ala Asn Gln Gln Asn Ile Ile Leu Asp Ser Tyr Met Gln His Thr His
   1085                1090                1095

tgc agt ctt tat cct aat cca agt aag aat tgc cgc cca aca cgt gat   3534
Cys Ser Leu Tyr Pro Asn Pro Ser Lys Asn Cys Arg Pro Thr Arg Asp
1100                1105                1110                1115

aaa cct tat tca tac tat cat tct gat aga aat gtt tat aaa gaa aaa   3582
Lys Pro Tyr Ser Tyr Tyr His Ser Asp Arg Asn Val Tyr Lys Glu Lys
                1120                1125                1130

cat aat atg ttg caa ttg aat tta gag aaa aaa att caa caa aat tgg   3630
His Asn Met Leu Gln Leu Asn Leu Glu Lys Lys Ile Gln Gln Asn Trp
            1135                1140                1145

ctt act cat caa att gtc ttc aat ctt ggt ttt gat gac ttt act tca   3678
Leu Thr His Gln Ile Val Phe Asn Leu Gly Phe Asp Asp Phe Thr Ser
        1150                1155                1160
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gcg ctt cag cat aaa gat tat tta act cga cgt gtt acc gct acg gca   3726
Ala Leu Gln His Lys Asp Tyr Leu Thr Arg Arg Val Thr Ala Thr Ala
   1165                1170                1175

aag agt att tca gag aaa gct aat gaa aca aga aga aat ggt tac aaa   3774
Lys Ser Ile Ser Glu Lys Ala Asn Glu Thr Arg Arg Asn Gly Tyr Lys
1180                1185                1190                1195

aaa caa cct tac tta tac cca aaa cca aca gta ggt ttt gta gta caa   3822
Lys Gln Pro Tyr Leu Tyr Pro Lys Pro Thr Val Gly Phe Val Val Gln
               1200                1205                1210

gat cat tgt gat tat aaa ggt aac tcc tct aat tac aga gac tgt aaa   3870
Asp His Cys Asp Tyr Lys Gly Asn Ser Ser Asn Tyr Arg Asp Cys Lys
          1215                1220                1225

gtg cgg tta att aaa ggg aaa aat tat tat ttc gca gca cgc aat aat   3918
Val Arg Leu Ile Lys Gly Lys Asn Tyr Tyr Phe Ala Ala Arg Asn Asn
       1230                1235                1240

atg gca tta ggg aaa tac gtt gat tta ggt tta ggt att cgg tat gac   3966
Met Ala Leu Gly Lys Tyr Val Asp Leu Gly Leu Gly Ile Arg Tyr Asp
   1245                1250                1255

gta tct cgc aca aaa gct aat gaa tca act att agt gtt ggt aaa ttt   4014
Val Ser Arg Thr Lys Ala Asn Glu Ser Thr Ile Ser Val Gly Lys Phe
1260                1265                1270                1275

aaa aat ttc tct tgg aat act ggt att gtc ata aaa cca acg gaa tgg   4062
Lys Asn Phe Ser Trp Asn Thr Gly Ile Val Ile Lys Pro Thr Glu Trp
               1280                1285                1290

ctt gat ctt tct tat cgc ctt tct act gga ttt aga aat cct agt ttt   4110
Leu Asp Leu Ser Tyr Arg Leu Ser Thr Gly Phe Arg Asn Pro Ser Phe
          1295                1300                1305

gct gaa atg tat ggt tgg cgg tat ggt ggc aat aat agc gag gtt tat   4158
Ala Glu Met Tyr Gly Trp Arg Tyr Gly Gly Asn Asn Ser Glu Val Tyr
       1310                1315                1320

gta ggt aaa ttt aag cct gaa aca tct cgt aac caa gag ttt ggt ctc   4206
Val Gly Lys Phe Lys Pro Glu Thr Ser Arg Asn Gln Glu Phe Gly Leu
   1325                1330                1335

gct cta aaa ggg gat ttt ggt aat att gag atc agt cat ttt agt aat   4254
Ala Leu Lys Gly Asp Phe Gly Asn Ile Glu Ile Ser His Phe Ser Asn
1340                1345                1350                1355

gct tat cga aat ctt atc gcc ttt gct gaa gaa ctt aat aaa aat gga   4302
Ala Tyr Arg Asn Leu Ile Ala Phe Ala Glu Glu Leu Asn Lys Asn Gly
               1360                1365                1370

act gga aag gcc aat tat gga tat cat aat gca caa aat gca aaa tta   4350
Thr Gly Lys Ala Asn Tyr Gly Tyr His Asn Ala Gln Asn Ala Lys Leu
          1375                1380                1385

gtt ggc gta aat ata act gcg caa tta gat ttt aat ggt tta tgg aaa   4398
Val Gly Val Asn Ile Thr Ala Gln Leu Asp Phe Asn Gly Leu Trp Lys
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       1390                1395                1400

cgt att ccc tac ggt tgg tat gca aca ttt gct tat aac cga gta aaa   4446
Arg Ile Pro Tyr Gly Trp Tyr Ala Thr Phe Ala Tyr Asn Arg Val Lys
   1405                1410                1415

gtt aaa gat caa aaa atc aat gct ggt ttg gcc tcc gta agc agt tat   4494
Val Lys Asp Gln Lys Ile Asn Ala Gly Leu Ala Ser Val Ser Ser Tyr
1420                1425                1430                1435

tta ttt gat gcc att cag ccc agc cgt tat atc att ggt tta ggc tat   4542
Leu Phe Asp Ala Ile Gln Pro Ser Arg Tyr Ile Ile Gly Leu Gly Tyr
               1440                1445                1450

gat cat cca agt aat act tgg gga att aat aca atg ttt act caa tca   4590
Asp His Pro Ser Asn Thr Trp Gly Ile Asn Thr Met Phe Thr Gln Ser
           1455                1460                1465

aaa gca aaa tct caa aat gaa ttg cta gga aaa cgt gca ttg ggt aac   4638
Lys Ala Lys Ser Gln Asn Glu Leu Leu Gly Lys Arg Ala Leu Gly Asn
       1470                1475                1480

aat tca agg gat gta aaa tca aca aga aaa ctt act cgg gca tgg cat   4686
Asn Ser Arg Asp Val Lys Ser Thr Arg Lys Leu Thr Arg Ala Trp His
   1485                1490                1495

atc tta gat gta tcg ggt tat tac atg gcg aat aaa aat att atg ctt   4734
Ile Leu Asp Val Ser Gly Tyr Tyr Met Ala Asn Lys Asn Ile Met Leu
1500                1505                1510                1515

cga tta ggg ata tat aat tta ttc aac tat cgc tat gtt act tgg gaa   4782
Arg Leu Gly Ile Tyr Asn Leu Phe Asn Tyr Arg Tyr Val Thr Trp Glu
               1520                1525                1530

gcg gtg cgt caa aca gca caa ggt gcg gtc aat caa cat caa aat gtt   4830
Ala Val Arg Gln Thr Ala Gln Gly Ala Val Asn Gln His Gln Asn Val
           1535                1540                1545

ggt agc tat act cgc tac gca gca tca gga cga aac tat acc tta aca   4878
Gly Ser Tyr Thr Arg Tyr Ala Ala Ser Gly Arg Asn Tyr Thr Leu Thr
       1550                1555                1560

tta gaa atg aaa ttctaaatta aaatgcgcca gatggactag acatgctata       4930
Leu Glu Met Lys
   1565

tctatacctt actggcgcat ctttttctgt tctataatct ggttaagtga aaaaccaaac 4990

ttggattttt tagaagatct ttccacgcat ttattgtaaa atctccgaca atttttaccg 5050

cacttttctc tattacaaaa acaataagga tccttttgtg aatctctca             5099
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<210> 5
<211> 913
<212> PRT
<213> Haemophilus influenzae

<400> 5

```
Met Thr Lys Lys Pro Tyr Phe Arg Leu Ser Ile Ile Ser Cys Leu Leu
 1               5                  10                  15

Ile Ser Cys Tyr Val Lys Ala Glu Thr Gln Ser Ile Lys Asp Thr Lys
            20                  25                  30

Glu Ala Ile Ser Ser Glu Val Asp Thr Gln Ser Thr Glu Asp Ser Glu
        35                  40                  45

Leu Glu Thr Ile Ser Val Thr Ala Glu Lys Val Arg Asp Arg Lys Asp
    50                  55                  60

Asn Glu Val Thr Gly Leu Gly Lys Ile Ile Lys Thr Ser Glu Ser Ile
65                  70                  75                  80

Ser Arg Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro
                85                  90                  95

Gly Ile Ser Val Val Glu Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ser
            100                 105                 110

Ile Arg Gly Met Asp Arg Asn Arg Val Ala Leu Leu Val Asp Gly Leu
        115                 120                 125

Pro Gln Thr Gln Ser Tyr Val Val Gln Ser Pro Leu Val Ala Arg Ser
    130                 135                 140

Gly Tyr Ser Gly Thr Gly Ala Ile Asn Glu Ile Glu Tyr Glu Asn Val
145                 150                 155                 160

Lys Ala Val Glu Ile Ser Lys Gly Gly Ser Ser Ser Glu Tyr Gly Asn
                165                 170                 175

Gly Ala Leu Ala Gly Ser Val Thr Phe Gln Ser Lys Ser Ala Ala Asp
            180                 185                 190

Ile Leu Glu Gly Asp Lys Ser Trp Gly Ile Gln Thr Lys Asn Ala Tyr
        195                 200                 205

Ser Ser Lys Asn Lys Gly Phe Thr His Ser Leu Ala Val Ala Gly Lys
    210                 215                 220

Gln Gly Gly Phe Glu Gly Val Ala Ile Tyr Thr His Arg Asn Ser Ile
225                 230                 235                 240

Glu Thr Gln Val His Lys Asp Ala Leu Lys Gly Val Gln Ser Tyr Asp
                245                 250                 255

Arg Phe Ile Ala Thr Thr Glu Asp Gln Ser Ala Tyr Phe Val Met Gln
            260                 265                 270

Asp Glu Cys Leu Asp Gly Tyr Asp Lys Cys Lys Thr Ser Pro Lys Arg
        275                 280                 285

Pro Ala Thr Leu Ser Thr Gln Arg Glu Thr Val Ser Val Ser Asp Tyr
    290                 295                 300

Thr Gly Ala Asn Arg Ile Lys Pro Asn Pro Met Lys Tyr Glu Ser Gln
```

```
305                 310                 315                 320

Ser Trp Phe Leu Arg Gly Gly Tyr His Phe Ser Glu Gln His Tyr Ile
                325                 330                 335

Gly Gly Ile Phe Glu Phe Thr Gln Gln Lys Phe Asp Ile Arg Asp Met
            340                 345                 350

Thr Phe Pro Ala Tyr Leu Arg Pro Thr Glu Asp Lys Asp Leu Gln Ser
        355                 360                 365

Arg Pro Phe Tyr Pro Lys Gln Asp Tyr Gly Ala Tyr Gln His Ile Gly
    370                 375                 380

Asp Gly Arg Gly Val Lys Tyr Ala Ser Gly Leu Tyr Phe Asp Glu His
385                 390                 395                 400

His Arg Lys Gln Arg Val Gly Ile Glu Tyr Ile Tyr Glu Asn Lys Asn
                405                 410                 415

Lys Ala Gly Ile Ile Asp Lys Ala Val Leu Ser Ala Asn Gln Gln Asn
            420                 425                 430

Ile Ile Leu Asp Ser Tyr Met Arg His Thr His Cys Ser Leu Tyr Pro
        435                 440                 445

Asn Pro Ser Lys Asn Cys Arg Pro Thr Leu Asp Lys Pro Tyr Ser Tyr
    450                 455                 460

Tyr His Ser Asp Arg Asn Val Tyr Lys Glu Lys His Asn Met Leu Gln
465                 470                 475                 480

Leu Asn Leu Glu Lys Lys Ile Gln Gln Asn Trp Leu Thr His Gln Ile
                485                 490                 495

Ala Phe Asn Leu Gly Phe Asp Asp Phe Thr Ser Ala Leu Gln His Lys
            500                 505                 510

Asp Tyr Leu Thr Arg Arg Val Ile Ala Thr Ala Ser Ser Ile Ser Glu
        515                 520                 525

Lys Arg Gly Glu Ala Arg Arg Asn Gly Leu Gln Ser Ser Pro Tyr Leu
    530                 535                 540

Tyr Pro Thr Pro Lys Ala Glu Leu Val Gly Gly Asp Leu Cys Asn Tyr
545                 550                 555                 560

Gln Gly Lys Ser Ser Asn Tyr Ser Asp Cys Lys Val Arg Leu Ile Lys
                565                 570                 575

Gly Lys Asn Tyr Tyr Phe Ala Ala Arg Asn Asn Met Ala Leu Gly Lys
            580                 585                 590

Tyr Val Asp Leu Gly Leu Gly Met Arg Tyr Asp Val Ser Arg Thr Lys
        595                 600                 605

Ala Asn Glu Ser Thr Ile Ser Val Gly Lys Phe Lys Asn Phe Ser Trp
    610                 615                 620
```

```
Asn Thr Gly Ile Val Ile Lys Pro Thr Glu Trp Leu Asp Leu Ser Tyr
625                 630                 635                 640

Arg Leu Ser Thr Gly Phe Arg Asn Pro Ser Phe Ala Glu Met Tyr Gly
                645                 650                 655

Trp Arg Tyr Gly Gly Lys Asp Thr Asp Val Tyr Ile Gly Lys Phe Lys
            660                 665                 670

Pro Glu Thr Ser Arg Asn Gln Glu Phe Gly Leu Ala Leu Lys Gly Asp
        675                 680                 685

Phe Gly Asn Ile Glu Ile Ser His Phe Ser Asn Ala Tyr Arg Asn Leu
    690                 695                 700

Ile Ala Phe Ala Glu Glu Leu Ser Lys Asn Gly Thr Thr Gly Lys Gly
705                 710                 715                 720

Asn Tyr Gly Tyr His Asn Ala Gln Asn Ala Lys Leu Val Gly Val Asn
                725                 730                 735

Ile Thr Ala Gln Leu Asp Phe Asn Gly Leu Trp Lys Arg Ile Pro Tyr
            740                 745                 750

Gly Trp Tyr Ala Thr Phe Ala Tyr Asn Arg Val Lys Val Lys Asp Gln
        755                 760                 765

Lys Ile Asn Ala Gly Leu Ala Ser Val Ser Ser Tyr Leu Phe Asp Ala
    770                 775                 780

Ile Gln Pro Ser Arg Tyr Ile Ile Gly Leu Gly Tyr Asp His Pro Ser
785                 790                 795                 800

Asn Thr Trp Gly Ile Lys Thr Met Phe Thr Gln Ser Lys Ala Lys Ser
                805                 810                 815

Gln Asn Glu Leu Leu Gly Lys Arg Ala Leu Gly Asn Asn Ser Arg Asn
            820                 825                 830

Val Lys Ser Thr Arg Lys Leu Thr Arg Ala Trp His Ile Leu Asp Val
        835                 840                 845

Ser Gly Tyr Tyr Met Val Asn Arg Ser Ile Leu Phe Arg Leu Gly Val
    850                 855                 860

Tyr Asn Leu Leu Asn Tyr Arg Tyr Val Thr Trp Glu Ala Val Arg Gln
865                 870                 875                 880

Thr Ala Gln Gly Ala Val Asn Gln His Gln Asn Val Gly Asn Tyr Thr
                885                 890                 895

Arg Tyr Ala Ala Ser Gly Arg Asn Tyr Thr Leu Thr Leu Glu Met Lys
            900                 905                 910

Phe
```

<210> 6

<211> 644
<212> PRT
<213> Haemophilus influenzae

<400> 6

```
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
 1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Ser Ser Arg Thr
        35                  40                  45

Lys Ser Lys Leu Glu Lys Leu Ser Ile Pro Ser Leu Gly Gly Gly Met
    50                  55                  60

Lys Leu Ala Ala Leu Asn Leu Phe Asp Arg Asn Lys Pro Ser Leu Leu
65                  70                  75                  80

Asn Glu Asp Ser Tyr Met Ile Phe Ser Ser Arg Ser Thr Ile Glu Glu
                85                  90                  95

Asp Val Lys Asn Asp Asn Gln Asn Gly Glu His Pro Ile Asp Ser Ile
            100                 105                 110

Val Asp Pro Arg Ala Pro Asn Ser Asn Glu Asn Arg His Gly Gln Lys
        115                 120                 125

Tyr Val Tyr Ser Gly Leu Tyr Tyr Ile Gln Ser Trp Ser Leu Arg Asp
    130                 135                 140

Leu Pro Asn Lys Lys Phe Tyr Ser Gly Tyr Tyr Gly Tyr Ala Tyr Tyr
145                 150                 155                 160

Phe Gly Asn Thr Thr Ala Ser Ala Leu Pro Val Gly Gly Val Ala Thr
                165                 170                 175

Tyr Lys Gly Thr Trp Ser Phe Ile Thr Ala Ala Glu Asn Gly Lys Asn
            180                 185                 190

Tyr Glu Leu Leu Arg Asn Ser Gly Gly Gly Gln Ala Tyr Ser Arg Arg
        195                 200                 205

Ser Ala Thr Pro Glu Asp Ile Asp Leu Asp Arg Lys Thr Gly Leu Thr
    210                 215                 220

Ser Glu Phe Thr Val Asn Phe Gly Thr Lys Lys Leu Thr Gly Gly Leu
225                 230                 235                 240

Tyr Tyr Asn Leu Arg Glu Thr Asp Ala Asn Lys Ser Gln Asn Arg Thr
                245                 250                 255

His Lys Leu Tyr Asp Leu Glu Ala Asp Val His Ser Asn Arg Phe Arg
            260                 265                 270

Gly Lys Val Lys Pro Thr Lys Lys Glu Ser Ser Glu Glu His Pro Phe
        275                 280                 285
```

```
Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Glu Gly Gln
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala His Asp Lys Lys Val Leu Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Gln Gln Glu Thr Ser Glu Asn Lys Lys Leu Pro
                325                 330                 335

Lys Glu Thr Leu Ile Asp Gly Lys Leu Thr Thr Phe Lys Thr Thr Asn
            340                 345                 350

Ala Thr Ala Asn Ala Thr Thr Asp Ala Thr Thr Ser Thr Thr Ala Ser
        355                 360                 365

Thr Lys Thr Asp Thr Thr Thr Asn Ala Thr Ala Asn Thr Glu Asn Phe
    370                 375                 380

Thr Thr Lys Asp Ile Pro Ser Leu Gly Glu Ala Asp Tyr Leu Leu Ile
385                 390                 395                 400

Asp Asn Tyr Pro Val Pro Leu Phe Pro Glu Ser Gly Asp Phe Ile Ser
                405                 410                 415

Ser Lys His His Thr Val Gly Lys Lys Thr Tyr Gln Val Glu Ala Cys
            420                 425                 430

Cys Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Ala Pro
        435                 440                 445

Pro Lys Glu Glu Glu Lys Glu Lys Glu Lys Asp Lys Asp Lys Glu Lys
    450                 455                 460

Glu Lys Gln Ala Thr Thr Ser Ile Lys Thr Tyr Tyr Gln Phe Leu Leu
465                 470                 475                 480

Gly Leu Arg Thr Pro Ser Ser Glu Ile Pro Lys Glu Gly Ser Ala Lys
                485                 490                 495

Tyr His Gly Asn Trp Phe Gly Tyr Ile Ser Asp Gly Glu Thr Ser Tyr
            500                 505                 510

Ser Ala Ser Gly Asp Lys Glu Arg Ser Lys Asn Ala Val Ala Glu Phe
        515                 520                 525

Asn Val Asn Phe Ala Glu Lys Thr Leu Thr Gly Glu Leu Lys Arg His
    530                 535                 540

Asp Thr Gln Asn Pro Val Phe Lys Ile Asn Ala Thr Phe Gln Ser Gly
545                 550                 555                 560

Lys Asn Asp Phe Thr Gly Thr Ala Thr Ala Lys Asp Leu Ala Ile Asp
                565                 570                 575

Gly Lys Asn Thr Gln Gly Thr Ser Lys Val Asn Phe Thr Ala Thr Val
            580                 585                 590

Asn Gly Ala Phe Tyr Gly Pro His Ala Thr Glu Leu Gly Gly Tyr Phe
        595                 600                 605
```

```
Thr Tyr Asn Gly Asn Asn Pro Thr Asp Lys Asn Ser Ser Ser Asn Ser
    610                 615                 620

Glu Lys Ala Arg Ala Ala Val Val Phe Gly Ala Lys Lys Gln Gln Val
625                 630                 635                 640

Glu Thr Thr Lys
```

<210> 7
<211> 912
<212> PRT
<213> Haemophilus influenzae

<400> 7

```
Met Thr Lys Lys Pro Tyr Phe Arg Leu Ser Ile Ile Ser Cys Leu Leu
  1               5                  10                  15

Ile Ser Cys Tyr Val Lys Ala Glu Thr Gln Ser Ile Lys Asp Thr Lys
            20                  25                  30

Glu Ala Ile Ser Ser Glu Val Asp Thr Gln Ser Thr Glu Asp Ser Glu
        35                  40                  45

Leu Glu Thr Ile Ser Val Thr Ala Glu Lys Ile Arg Asp Arg Lys Asp
    50                  55                  60

Asn Glu Val Thr Gly Leu Gly Lys Ile Ile Lys Thr Ser Glu Ser Ile
65                  70                  75                  80

Ser Arg Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro
                85                  90                  95

Gly Ile Ser Val Val Glu Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ser
            100                 105                 110

Ile Arg Gly Met Asp Arg Asn Arg Val Ala Leu Leu Val Asp Gly Leu
        115                 120                 125

Pro Gln Thr Gln Ser Tyr Val Val Gln Ser Pro Leu Val Ala Arg Ser
    130                 135                 140

Gly Tyr Ser Gly Thr Gly Ala Ile Asn Glu Ile Glu Tyr Glu Asn Val
145                 150                 155                 160

Lys Ala Val Glu Ile Ser Lys Gly Gly Ser Ser Ser Glu Tyr Gly Asn
                165                 170                 175

Gly Ala Leu Ala Gly Ser Val Thr Phe Gln Ser Lys Ser Ala Ala Asp
            180                 185                 190

Ile Leu Glu Gly Asp Lys Ser Trp Gly Ile Gln Thr Lys Asn Ala Tyr
        195                 200                 205

Ser Ser Lys Asn Lys Gly Phe Thr His Ser Leu Ala Val Ala Gly Lys
    210                 215                 220
```

```
Gln Gly Gly Phe Glu Gly Leu Ala Ile Tyr Thr Gln Arg Asn Ser Ile
225                 230                 235                 240

Glu Thr Gln Val His Lys Asp Ala Leu Lys Gly Val Gln Ser Tyr Asp
                245                 250                 255

Arg Leu Ile Ala Thr Thr Asp Lys Ser Ser Gly Tyr Phe Val Ile Gln
            260                 265                 270

Gly Glu Cys Pro Asn Gly Asp Asp Lys Cys Ala Ala Lys Pro Pro Ala
        275                 280                 285

Thr Leu Ser Thr Gln Ser Glu Thr Val Ser Val Ser Asp Tyr Thr Gly
    290                 295                 300

Ala Asn Arg Ile Lys Pro Asn Pro Met Lys Tyr Glu Ser Gln Ser Trp
305                 310                 315                 320

Phe Leu Arg Gly Gly Tyr His Phe Ser Glu Gln His Tyr Ile Gly Gly
                325                 330                 335

Ile Phe Glu Phe Thr Gln Gln Lys Phe Asp Ile Arg Asp Met Thr Phe
            340                 345                 350

Pro Ala Tyr Leu Ser Pro Thr Glu Arg Arg Asp Asp Ser Ser Arg Ser
        355                 360                 365

Phe Tyr Pro Met Gln Asp His Gly Ala Tyr Gln His Ile Glu Asp Gly
    370                 375                 380

Arg Gly Val Lys Tyr Ala Ser Gly Leu Tyr Phe Asp Glu His His Arg
385                 390                 395                 400

Lys Gln Arg Val Gly Ile Glu Tyr Ile Tyr Glu Asn Lys Asn Lys Ala
                405                 410                 415

Gly Ile Ile Asp Lys Ala Val Leu Ser Ala Asn Gln Gln Asn Ile Ile
            420                 425                 430

Leu Asp Ser Tyr Met Arg His Thr His Cys Ser Leu Tyr Pro Asn Pro
        435                 440                 445

Ser Lys Asn Cys Arg Pro Thr Leu Asp Lys Pro Tyr Ser Tyr Tyr Arg
    450                 455                 460

Ser Asp Arg Asn Val Tyr Lys Glu Lys His Asn Met Leu Gln Leu Asn
465                 470                 475                 480

Leu Glu Lys Lys Ile Gln Gln Asn Trp Leu Thr His Gln Ile Val Phe
                485                 490                 495

Asn Leu Gly Phe Asp Asp Phe Thr Ser Ala Leu Gln His Lys Asp Tyr
            500                 505                 510

Leu Thr Arg Arg Val Ile Ala Thr Ala Asp Ser Ile Pro Arg Lys Pro
        515                 520                 525

Gly Glu Thr Gly Lys Pro Arg Asn Gly Leu Gln Ser Gln Pro Tyr Leu
    530                 535                 540
```

```
Tyr Pro Lys Pro Glu Pro Tyr Phe Ala Gly Gln Asp His Cys Asn Tyr
545                 550                 555                 560

Gln Gly Ser Ser Ser Asn Tyr Arg Asp Cys Lys Val Arg Leu Ile Lys
                565                 570                 575

Gly Lys Asn Tyr Tyr Phe Ala Ala Arg Asn Asn Met Ala Leu Gly Lys
            580                 585                 590

Tyr Val Asp Leu Gly Leu Gly Ile Arg Tyr Asp Val Ser Arg Thr Lys
        595                 600                 605

Ala Asn Glu Ser Thr Ile Ser Val Gly Lys Phe Lys Asn Phe Ser Trp
    610                 615                 620

Asn Thr Gly Ile Val Ile Lys Pro Thr Glu Trp Leu Asp Leu Ser Tyr
625                 630                 635                 640

Arg Leu Ser Thr Gly Phe Arg Asn Pro Ser Phe Ser Glu Met Tyr Gly
                645                 650                 655

Trp Arg Tyr Gly Gly Lys Asn Asp Glu Val Tyr Val Gly Lys Phe Lys
            660                 665                 670

Pro Glu Thr Ser Arg Asn Gln Glu Phe Gly Leu Ala Leu Lys Gly Asp
        675                 680                 685

Phe Gly Asn Ile Glu Ile Ser His Phe Ser Asn Ala Tyr Arg Asn Leu
    690                 695                 700

Ile Ala Phe Ala Glu Glu Leu Ser Lys Asn Gly Thr Gly Lys Gly Asn
705                 710                 715                 720

Tyr Gly Tyr His Asn Ala Gln Asn Ala Lys Leu Val Gly Val Asn Ile
                725                 730                 735

Thr Ala Gln Leu Asp Phe Asn Gly Leu Trp Lys Arg Ile Pro Tyr Gly
            740                 745                 750

Trp Tyr Ala Thr Phe Ala Tyr Asn Gln Val Lys Val Lys Asp Gln Lys
        755                 760                 765

Ile Asn Ala Gly Leu Ala Ser Val Ser Ser Tyr Leu Phe Asp Ala Ile
    770                 775                 780

Gln Pro Ser Arg Tyr Ile Ile Gly Leu Gly Tyr Asp His Pro Ser Asn
785                 790                 795                 800

Thr Trp Gly Ile Asn Thr Met Phe Thr Gln Ser Lys Ala Lys Ser Gln
                805                 810                 815

Asn Glu Leu Leu Gly Lys Arg Ala Leu Gly Asn Asn Ser Arg Asp Val
            820                 825                 830

Lys Ser Thr Arg Lys Leu Thr Arg Ala Trp His Ile Leu Asp Val Ser
        835                 840                 845

Gly Tyr Tyr Met Ala Asn Lys Asn Ile Met Leu Arg Leu Gly Ile Tyr
```

```
    850                 855                 860

Asn Leu Phe Asn Tyr Arg Tyr Val Thr Trp Glu Ala Val Arg Gln Thr
865                 870                 875                 880

Ala Gln Gly Ala Val Asn Gln His Gln Asn Val Gly Ser Tyr Thr Arg
                885                 890                 895

Tyr Ala Ala Ser Gly Arg Asn Tyr Thr Leu Thr Leu Glu Met Lys Phe
            900                 905                 910
```

<210> 8
<211> 660
<212> PRT
<213> Haemophilus influenzae

<400> 8

```
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
    50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205
```

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Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser
                405                 410                 415

Lys His His Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala Cys Cys
            420                 425                 430

Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Pro Leu
        435                 440                 445

Lys Glu Lys Glu Thr Glu Thr Glu Thr Glu Thr Glu Lys Asp Lys Glu
    450                 455                 460

Lys Glu Lys Glu Lys Asp Lys Asp Lys Glu Lys Gln Thr Ala Ala Thr
465                 470                 475                 480

Thr Asn Thr Tyr Tyr Gln Phe Leu Leu Gly His Arg Thr Pro Lys Asp
                485                 490                 495

Asp Ile Pro Lys Thr Gly Ser Ala Lys Tyr His Gly Ser Trp Phe Gly
            500                 505                 510

Tyr Ile Thr Asp Gly Lys Thr Ser Tyr Ser Pro Ser Gly Asp Lys Lys
        515                 520                 525
```

```
Arg Asp Lys Asn Ala Val Ala Glu Phe Asn Val Asp Phe Ala Glu Lys
    530                 535                 540

Lys Leu Thr Gly Glu Leu Lys Arg His Asp Thr Gly Asn Pro Val Phe
545                 550                 555                 560

Ser Ile Glu Ala Asn Phe Asn Asn Ser Ser Asn Ala Phe Thr Gly Thr
                565                 570                 575

Ala Thr Ala Thr Asn Phe Val Ile Asp Gly Lys Asn Ser Gln Asn Lys
            580                 585                 590

Asn Thr Pro Ile Asn Ile Thr Thr Lys Val Asn Gly Ala Phe Tyr Gly
        595                 600                 605

Pro Lys Ala Ser Glu Leu Gly Gly Tyr Phe Thr Tyr Asn Gly Asn Ser
    610                 615                 620

Thr Ala Thr Asn Ser Glu Ser Ser Ser Thr Val Ser Ser Ser Ser Asn
625                 630                 635                 640

Ser Lys Asn Ala Arg Ala Ala Val Val Phe Gly Ala Arg Gln Gln Val
                645                 650                 655

Glu Thr Thr Lys
            660
```

<210> 9
<211> 912
<212> PRT
<213> Haemophilus influenzae

<400> 9

```
Met Thr Lys Lys Pro Tyr Phe Arg Leu Ser Ile Ile Ser Cys Leu Leu
  1               5                  10                  15

Ile Ser Cys Tyr Val Lys Ala Glu Thr Gln Ser Ile Lys Asp Thr Lys
            20                  25                  30

Glu Ala Ile Ser Ser Glu Val Asp Thr Gln Ser Thr Glu Asp Ser Glu
        35                  40                  45

Leu Glu Thr Ile Ser Val Thr Ala Glu Lys Ile Arg Asp Arg Lys Asp
    50                  55                  60

Asn Glu Val Thr Gly Leu Gly Lys Ile Ile Lys Thr Ser Glu Ser Ile
65                  70                  75                  80

Ser Arg Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro
                85                  90                  95

Gly Ile Ser Val Val Glu Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ser
            100                 105                 110

Ile Arg Gly Met Asp Arg Asn Arg Val Ala Leu Leu Val Asp Gly Leu
        115                 120                 125
```

```
Pro Gln Thr Gln Ser Tyr Val Val Gln Ser Pro Leu Val Ala Arg Ser
    130                 135                 140

Gly Tyr Ser Gly Thr Gly Ala Ile Asn Glu Ile Glu Tyr Glu Asn Val
145                 150                 155                 160

Lys Ala Val Glu Ile Ser Lys Gly Gly Ser Ser Ser Glu Tyr Gly Asn
                165                 170                 175

Gly Ala Leu Ala Gly Ser Val Thr Phe Gln Ser Lys Ser Ala Ala Asp
            180                 185                 190

Ile Leu Glu Gly Asp Lys Ser Trp Gly Ile Gln Thr Lys Asn Ala Tyr
        195                 200                 205

Ser Ser Lys Asn Lys Gly Phe Thr His Ser Leu Ala Val Ala Gly Lys
    210                 215                 220

Gln Gly Gly Phe Glu Gly Leu Ala Ile Tyr Thr Gln Arg Asn Ser Ile
225                 230                 235                 240

Glu Thr Gln Val His Lys Asp Ala Leu Lys Gly Val Gln Ser Tyr Asp
                245                 250                 255

Arg Leu Ile Ala Thr Thr Asp Lys Ser Ser Gly Tyr Phe Val Ile Gln
            260                 265                 270

Gly Glu Cys Pro Asn Gly Asp Asp Lys Cys Ala Ala Lys Pro Pro Ala
        275                 280                 285

Thr Leu Ser Thr Gln Ser Glu Thr Val Ser Val Ser Asp Tyr Thr Gly
    290                 295                 300

Ala Asn Arg Ile Lys Pro Asn Pro Met Lys Tyr Glu Ser Gln Ser Trp
305                 310                 315                 320

Phe Leu Arg Gly Gly Tyr His Phe Ser Glu Gln His Tyr Ile Gly Gly
                325                 330                 335

Ile Phe Glu Phe Thr Gln Gln Lys Phe Asp Ile Arg Asp Met Thr Phe
            340                 345                 350

Pro Ala Tyr Leu Ser Pro Thr Glu Arg Arg Asp Asp Ser Ser Arg Ser
        355                 360                 365

Phe Tyr Pro Met Gln Asp His Gly Ala Tyr Gln His Ile Glu Asp Gly
    370                 375                 380

Arg Gly Val Lys Tyr Ala Ser Gly Leu Tyr Phe Asp Glu His His Arg
385                 390                 395                 400

Lys Gln Arg Val Gly Ile Glu Tyr Ile Tyr Glu Asn Lys Asn Lys Ala
                405                 410                 415

Gly Ile Ile Asp Lys Ala Val Leu Ser Ala Asn Gln Gln Asn Ile Ile
            420                 425                 430

Leu Asp Ser Tyr Met Arg His Thr His Cys Ser Leu Tyr Pro Asn Pro
        435                 440                 445
```

```
Ser Lys Asn Cys Arg Pro Thr Leu Asp Lys Pro Tyr Ser Tyr Tyr Arg
    450                 455                 460

Ser Asp Arg Asn Val Tyr Lys Glu Lys His Asn Met Leu Gln Leu Asn
465                 470                 475                 480

Leu Glu Lys Lys Ile Gln Gln Asn Trp Leu Thr His Gln Ile Val Phe
                485                 490                 495

Asn Leu Gly Phe Asp Asp Phe Thr Ser Ala Leu Gln His Lys Asp Tyr
            500                 505                 510

Leu Thr Arg Arg Val Ile Ala Thr Ala Asp Ser Ile Pro Arg Lys Pro
        515                 520                 525

Gly Glu Thr Gly Lys Pro Arg Asn Gly Leu Gln Ser Gln Pro Tyr Leu
    530                 535                 540

Tyr Pro Lys Pro Glu Pro Tyr Phe Ala Gly Gln Asp His Cys Asn Tyr
545                 550                 555                 560

Gln Gly Ser Ser Ser Asn Tyr Arg Asp Cys Lys Val Arg Leu Ile Lys
                565                 570                 575

Gly Lys Asn Tyr Tyr Phe Ala Ala Arg Asn Asn Met Ala Leu Gly Lys
            580                 585                 590

Tyr Val Asp Leu Gly Leu Gly Ile Arg Tyr Asp Val Ser Arg Thr Lys
        595                 600                 605

Ala Asn Glu Ser Thr Ile Ser Val Gly Lys Phe Lys Asn Phe Ser Trp
    610                 615                 620

Asn Thr Gly Ile Val Ile Lys Pro Thr Glu Trp Leu Asp Leu Ser Tyr
625                 630                 635                 640

Arg Leu Ser Thr Gly Phe Arg Asn Pro Ser Phe Ser Glu Met Tyr Gly
                645                 650                 655

Trp Arg Tyr Gly Gly Lys Asn Asp Glu Val Tyr Val Gly Lys Phe Lys
            660                 665                 670

Pro Glu Thr Ser Arg Asn Gln Glu Phe Gly Leu Ala Leu Lys Gly Asp
        675                 680                 685

Phe Gly Asn Ile Glu Ile Ser His Phe Ser Asn Ala Tyr Arg Asn Leu
    690                 695                 700

Ile Ala Phe Ala Glu Glu Leu Ser Lys Asn Gly Thr Gly Lys Gly Asn
705                 710                 715                 720

Tyr Gly Tyr His Asn Ala Gln Asn Ala Lys Leu Val Gly Val Asn Ile
                725                 730                 735

Thr Ala Gln Leu Asp Phe Asn Gly Leu Trp Lys Arg Ile Pro Tyr Gly
            740                 745                 750

Trp Tyr Ala Thr Phe Ala Tyr Asn Gln Val Lys Val Lys Asp Gln Lys
```

```
        755                 760                 765

Ile Asn Ala Gly Leu Ala Ser Val Ser Ser Tyr Leu Phe Asp Ala Ile
    770                 775                 780

Gln Pro Ser Arg Tyr Ile Ile Gly Leu Gly Tyr Asp His Pro Ser Asn
785                 790                 795                 800

Thr Trp Gly Ile Asn Thr Met Phe Thr Gln Ser Lys Ala Lys Ser Gln
                805                 810                 815

Asn Glu Leu Leu Gly Lys Arg Ala Leu Gly Asn Asn Ser Arg Asp Val
            820                 825                 830

Lys Ser Thr Arg Lys Leu Thr Arg Ala Trp His Ile Leu Asp Val Ser
        835                 840                 845

Gly Tyr Tyr Met Ala Asn Lys Asn Ile Met Leu Arg Leu Gly Ile Tyr
    850                 855                 860

Asn Leu Phe Asn Tyr Arg Tyr Val Thr Trp Glu Ala Val Arg Gln Thr
865                 870                 875                 880

Ala Gln Gly Ala Val Asn Gln His Gln Asn Val Gly Ser Tyr Thr Arg
                885                 890                 895

Tyr Ala Ala Ser Gly Arg Asn Tyr Thr Leu Thr Leu Glu Met Lys Phe
            900                 905                 910
```

<210> 10
<211> 660
<212> PRT
<213> Haemophilus influenzae

<400> 10

```
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
    50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110
```

```
Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser
                405                 410                 415

Lys His His Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala Cys Cys
```

```
            420                 425                 430

Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Pro Leu
        435                 440                 445

Lys Glu Lys Glu Thr Glu Thr Glu Thr Glu Thr Glu Lys Asp Lys Glu
    450                 455                 460

Lys Glu Lys Glu Lys Asp Lys Asp Lys Glu Lys Gln Thr Ala Ala Thr
465                 470                 475                 480

Thr Asn Thr Tyr Tyr Gln Phe Leu Leu Gly His Arg Thr Pro Lys Asp
                485                 490                 495

Asp Ile Pro Lys Thr Gly Ser Ala Lys Tyr His Gly Ser Trp Phe Gly
            500                 505                 510

Tyr Ile Thr Asp Gly Lys Thr Ser Tyr Ser Pro Ser Gly Asp Lys Lys
        515                 520                 525

Arg Asp Lys Asn Ala Val Ala Glu Phe Asn Val Asp Phe Ala Glu Lys
    530                 535                 540

Lys Leu Thr Gly Glu Leu Lys Arg His Asp Thr Gly Asn Pro Val Phe
545                 550                 555                 560

Ser Ile Glu Ala Asn Phe Asn Asn Ser Ser Asn Ala Phe Thr Gly Thr
                565                 570                 575

Ala Thr Ala Thr Asn Phe Val Ile Asp Gly Lys Asn Ser Gln Asn Lys
            580                 585                 590

Asn Thr Pro Ile Asn Ile Thr Thr Lys Val Asn Gly Ala Phe Tyr Gly
        595                 600                 605

Pro Lys Ala Ser Glu Leu Gly Gly Tyr Phe Thr Tyr Asn Gly Asn Ser
    610                 615                 620

Thr Ala Thr Asn Ser Glu Ser Ser Ser Thr Val Ser Ser Ser Ser Asn
625                 630                 635                 640

Ser Lys Asn Ala Arg Ala Ala Val Val Phe Gly Ala Arg Gln Gln Val
                645                 650                 655

Glu Thr Thr Lys
            660
```

<210> 11
<211> 914
<212> PRT
<213> Haemophilus influenzae

```
<400> 11
Met Thr Lys Lys Pro Tyr Phe Arg Leu Ser Ile Ile Ser Cys Leu Leu
  1               5                  10                  15

Ile Ser Cys Tyr Val Lys Ala Glu Thr Gln Ser Ile Lys Asp Thr Lys
             20                  25                  30
```

```
Glu Ala Ile Ser Ser Glu Val Asp Thr Gln Ser Thr Glu Asp Ser Glu
         35                  40                  45

Leu Glu Thr Ile Ser Val Thr Ala Glu Lys Ile Arg Asp Arg Lys Asp
     50                  55                  60

Asn Glu Val Thr Gly Leu Gly Lys Ile Ile Lys Thr Ser Glu Ser Ile
 65                  70                  75                  80

Ser Arg Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro
                 85                  90                  95

Gly Ile Ser Val Val Glu Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ser
            100                 105                 110

Ile Arg Gly Met Asp Arg Asn Arg Val Ala Leu Leu Val Asp Gly Leu
        115                 120                 125

Pro Gln Thr Gln Ser Tyr Val Val Gln Ser Pro Leu Val Ala Arg Ser
    130                 135                 140

Gly Tyr Ser Gly Thr Gly Ala Ile Asn Glu Ile Glu Tyr Glu Asn Val
145                 150                 155                 160

Lys Ala Val Glu Ile Ser Lys Gly Gly Ser Ser Ser Glu Tyr Gly Asn
                165                 170                 175

Gly Ala Leu Ala Gly Ser Val Thr Phe Gln Ser Lys Ser Ala Ala Asp
            180                 185                 190

Ile Leu Glu Gly Asp Lys Ser Trp Gly Ile Gln Thr Lys Asn Ala Tyr
        195                 200                 205

Ser Ser Lys Asn Lys Gly Phe Thr His Ser Leu Ala Val Ala Gly Lys
    210                 215                 220

Gln Gly Gly Phe Asp Gly Val Ala Ile Tyr Thr Gln Arg Asn Ser Ile
225                 230                 235                 240

Glu Thr Gln Val His Lys Asp Ala Leu Lys Gly Val Gln Ser Tyr His
                245                 250                 255

Arg Leu Ile Ala Lys Pro Glu Asp Gln Ser Ala Tyr Phe Val Met Gln
            260                 265                 270

Asp Glu Cys Pro Lys Pro Asp Asp Tyr Asn Ser Cys Leu Pro Phe Ala
        275                 280                 285

Lys Arg Pro Ala Ile Leu Ser Ser Gln Arg Glu Thr Val Ser Val Ser
    290                 295                 300

Asp Tyr Thr Gly Ala Asn Arg Ile Lys Pro Asn Pro Met Lys Tyr Glu
305                 310                 315                 320

Ser Gln Ser Trp Phe Leu Arg Gly Gly Tyr His Phe Ser Glu Gln His
                325                 330                 335

Tyr Ile Gly Gly Ile Phe Glu Phe Thr Gln Gln Lys Phe Asp Ile Arg
```

```
                340                 345                 350

Asp Met Thr Phe Pro Ala Tyr Leu Arg Ser Thr Glu Lys Arg Asp Asp
        355                 360                 365

Ser Ser Gly Ser Phe Tyr Pro Lys Gln Asp Tyr Gly Ala Tyr Gln Arg
    370                 375                 380

Ile Glu Asp Gly Arg Gly Val Asn Tyr Ala Ser Gly Leu Tyr Phe Asp
385                 390                 395                 400

Glu His His Arg Lys Gln Arg Val Gly Ile Glu Tyr Ile Tyr Glu Asn
                405                 410                 415

Lys Asn Lys Ala Gly Ile Ile Asp Lys Ala Val Leu Ser Ala Asn Gln
            420                 425                 430

Gln Asn Ile Ile Leu Asp Ser Tyr Met Gln His Thr His Cys Ser Leu
        435                 440                 445

Tyr Pro Asn Pro Ser Lys Asn Cys Arg Pro Thr Arg Asp Lys Pro Tyr
    450                 455                 460

Ser Tyr Tyr His Ser Asp Arg Asn Val Tyr Lys Glu Lys His Asn Met
465                 470                 475                 480

Leu Gln Leu Asn Leu Glu Lys Lys Ile Gln Gln Asn Trp Leu Thr His
                485                 490                 495

Gln Ile Val Phe Asn Leu Gly Phe Asp Asp Phe Thr Ser Ala Leu Gln
            500                 505                 510

His Lys Asp Tyr Leu Thr Arg Arg Val Thr Ala Thr Ala Lys Ser Ile
        515                 520                 525

Ser Glu Lys Ala Asn Glu Thr Arg Arg Asn Gly Tyr Lys Lys Gln Pro
    530                 535                 540

Tyr Leu Tyr Pro Lys Pro Thr Val Gly Phe Val Val Gln Asp His Cys
545                 550                 555                 560

Asp Tyr Lys Gly Asn Ser Ser Asn Tyr Arg Asp Cys Lys Val Arg Leu
                565                 570                 575

Ile Lys Gly Lys Asn Tyr Tyr Phe Ala Ala Arg Asn Asn Met Ala Leu
            580                 585                 590

Gly Lys Tyr Val Asp Leu Gly Leu Gly Ile Arg Tyr Asp Val Ser Arg
        595                 600                 605

Thr Lys Ala Asn Glu Ser Thr Ile Ser Val Gly Lys Phe Lys Asn Phe
    610                 615                 620

Ser Trp Asn Thr Gly Ile Val Ile Lys Pro Thr Glu Trp Leu Asp Leu
625                 630                 635                 640

Ser Tyr Arg Leu Ser Thr Gly Phe Arg Asn Pro Ser Phe Ala Glu Met
                645                 650                 655
```

Tyr Gly Trp Arg Tyr Gly Gly Asn Asn Ser Glu Val Tyr Val Gly Lys
660 665 670

Phe Lys Pro Glu Thr Ser Arg Asn Gln Glu Phe Gly Leu Ala Leu Lys
675 680 685

Gly Asp Phe Gly Asn Ile Glu Ile Ser His Phe Ser Asn Ala Tyr Arg
690 695 700

Asn Leu Ile Ala Phe Ala Glu Glu Leu Asn Lys Asn Gly Thr Gly Lys
705 710 715 720

Ala Asn Tyr Gly Tyr His Asn Ala Gln Asn Ala Lys Leu Val Gly Val
725 730 735

Asn Ile Thr Ala Gln Leu Asp Phe Asn Gly Leu Trp Lys Arg Ile Pro
740 745 750

Tyr Gly Trp Tyr Ala Thr Phe Ala Tyr Asn Arg Val Lys Val Lys Asp
755 760 765

Gln Lys Ile Asn Ala Gly Leu Ala Ser Val Ser Ser Tyr Leu Phe Asp
770 775 780

Ala Ile Gln Pro Ser Arg Tyr Ile Ile Gly Leu Gly Tyr Asp His Pro
785 790 795 800

Ser Asn Thr Trp Gly Ile Asn Thr Met Phe Thr Gln Ser Lys Ala Lys
805 810 815

Ser Gln Asn Glu Leu Leu Gly Lys Arg Ala Leu Gly Asn Asn Ser Arg
820 825 830

Asp Val Lys Ser Thr Arg Lys Leu Thr Arg Ala Trp His Ile Leu Asp
835 840 845

Val Ser Gly Tyr Tyr Met Ala Asn Lys Asn Ile Met Leu Arg Leu Gly
850 855 860

Ile Tyr Asn Leu Phe Asn Tyr Arg Tyr Val Thr Trp Glu Ala Val Arg
865 870 875 880

Gln Thr Ala Gln Gly Ala Val Asn Gln His Gln Asn Val Gly Ser Tyr
885 890 895

Thr Arg Tyr Ala Ala Ser Gly Arg Asn Tyr Thr Leu Thr Leu Glu Met
900 905 910

Lys Phe

<210> 12
<211> 654
<212> PRT
<213> Haemophilus influenzae

<400> 12
Met Lys Ser Val Pro Leu Ile Thr Gly Gly Leu Ser Phe Leu Leu Ser

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1               5                  10                  15
Ala Cys Ser Gly Gly Gly Gly Ser Phe Asp Val Asp Asp Val Ser Asn
            20                  25                  30
Pro Ser Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg
        35                  40                  45
Thr Lys Ser Asp Leu Glu Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly
    50                  55                  60
Met Lys Leu Val Ala Gln Asn Phe Ile Gly Ala Arg Glu Pro Ser Phe
65                  70                  75                  80
Leu Asn Glu Asp Gly Tyr Met Ile Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95
Glu Asp Val Glu Lys Val Lys Asn Asn Asn Lys Asn Gly Gly Arg Leu
            100                 105                 110
Ile Gly Ser Ile Glu Glu Pro Asn Gly Thr Ser Gln Asn Ser Asn Ser
        115                 120                 125
Gln Glu Tyr Val Tyr Ser Gly Leu Tyr Tyr Ile Asp Ser Trp Arg Asp
    130                 135                 140
Tyr Lys Lys Glu Glu Gln Lys Ala Tyr Thr Gly Tyr Tyr Gly Tyr Ala
145                 150                 155                 160
Phe Tyr Tyr Gly Asn Glu Thr Ala Lys Asn Leu Pro Val Lys Gly Val
                165                 170                 175
Ala Lys Tyr Lys Gly Thr Trp Asn Phe Ile Thr Ala Thr Glu Asn Gly
            180                 185                 190
Lys Arg Tyr Ser Leu Phe Ser Asn Ser Ile Gly Gln Ala Tyr Ser Arg
        195                 200                 205
Arg Ser Ala Ile Ser Glu Asp Ile Tyr Asn Leu Glu Asn Gly Asp Ala
    210                 215                 220
Gly Leu Ile Ser Glu Phe Ser Val Asp Phe Gly Lys Lys Glu Leu Thr
225                 230                 235                 240
Gly Glu Leu Tyr Tyr Asn Glu Arg Lys Thr Ser Val Asn Glu Ser Gln
                245                 250                 255
Asn Thr Thr His Lys Leu Tyr Thr Leu Glu Ala Lys Val Tyr Ser Asn
            260                 265                 270
Arg Phe Arg Gly Lys Val Lys Pro Thr Lys Thr Lys Ser Glu Asp His
        275                 280                 285
Pro Phe Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn
    290                 295                 300
Ala Glu Glu Leu Gly Gly Lys Phe Leu Ala Asn Asp Glu Lys Val Phe
305                 310                 315                 320
```

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Gly Val Phe Ser Ala Lys Glu Asp Pro Gln Asn Pro Glu Asn Gln Lys
                325                 330                 335

Leu Ser Thr Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Lys Arg
            340                 345                 350

Thr Asp Ala Thr Thr Asn Ala Thr Thr Asp Ala Lys Thr Ser Ala Thr
        355                 360                 365

Thr Asp Ala Thr Ser Thr Thr Ala Asn Lys Lys Thr Asp Ala Glu Asn
    370                 375                 380

Phe Lys Thr Glu Asp Ile Pro Ser Phe Gly Glu Ala Asp Tyr Leu Leu
385                 390                 395                 400

Ile Gly Asn Gln Pro Ile Pro Leu Leu Pro Glu Lys Asn Thr Asp Asp
                405                 410                 415

Phe Ile Ser Ser Lys His His Thr Val Gly Gly Lys Thr Tyr Lys Val
            420                 425                 430

Glu Ala Cys Cys Lys Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr
        435                 440                 445

Glu Asp Lys Asp Lys Asp Asn Lys Asn Glu Thr Asp Lys Glu Lys Gly
    450                 455                 460

Lys Glu Lys Pro Thr Thr Thr Thr Ser Ile Asn Thr Tyr Tyr Gln Phe
465                 470                 475                 480

Leu Leu Gly Leu Arg Thr Pro Lys Asp Glu Ile Pro Lys Glu Gly Ser
                485                 490                 495

Ala Lys Tyr His Gly Asn Trp Phe Gly Tyr Ile Ser Asp Gly Glu Thr
            500                 505                 510

Ser Tyr Ser Ala Ser Gly Asp Lys Glu Arg Ser Lys Asn Ala Val Ala
        515                 520                 525

Glu Phe Asp Val Ser Phe Ala Asn Lys Thr Leu Thr Gly Glu Leu Lys
    530                 535                 540

Arg His Asp Asn Gly Asn Thr Val Phe Lys Ile Asn Ala Glu Leu Asn
545                 550                 555                 560

Gly Ser Asn Asp Phe Thr Gly Thr Ala Thr Ala Thr Asn Phe Val Ile
                565                 570                 575

Asp Gly Asn Asn Ser Gln Thr Ser Asn Ala Lys Ile Asn Ile Thr Thr
            580                 585                 590

Lys Val Asn Gly Ala Phe Tyr Gly Pro Lys Ala Ser Glu Leu Gly Gly
        595                 600                 605

Tyr Phe Thr Tyr Asn Gly Lys Asn Pro Thr Ala Thr Asn Ser Glu Ser
    610                 615                 620

Ser Ser Thr Val Pro Ser Pro Pro Asn Ser Pro Asn Ala Ser Ala Ala
625                 630                 635                 640
```

Val Val Phe Gly Ala Lys Lys Gln Val Glu Thr Thr Asn Lys
645 650

<210> 13
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 13
Ala Glu Thr Gln Ser Ile Lys Asp Thr Lys Glu Ala Ile Ser Ser Glu
1 5 10 15

Val Asp Thr Gln Ser Thr Glu Asp Ser Glu Leu Glu Thr Ile Ser Val
20 25 30

Thr Ala Glu Lys
35

<210> 14
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 14
Ser Val Thr Ala Glu Lys Val Arg Asp Arg Lys Asp Asn Glu Val Thr
1 5 10 15

Gly Leu Gly Lys Ile Ile Lys Thr Ser Glu Ser Ile Ser Arg Glu Gln
20 25 30

Val Leu Asn Ile
35

<210> 15
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 15
Ser Arg Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro
1 5 10 15

Gly Ile Ser Val Val Glu Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ser
20 25 30

Ile Arg Gly Met
35

<210> 16
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 16

Gly Tyr Ser Ile Arg Gly Met Asp Arg Asn Arg Val Ala Leu Leu Val
1 5 10 15

Asp Gly Leu Pro Gln Thr Gln Ser Tyr Val Val Gln Ser Pro Leu Val
20 25 30

Ala Arg Ser Gly
35

<210> 17
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 17
Pro Leu Val Ala Arg Ser Gly Tyr Gly Thr Gly Ala Ile Asn Glu Ile
1 5 10 15

Glu Tyr Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly Gly Ser Ser
20 25 30

Ser Glu Tyr Gly
35

<210> 18
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 18
Ser Ser Ser Glu Tyr Gly Asn Gly Ala Leu Ala Gly Ser Val Thr Phe
1 5 10 15

Gln Ser Lys Ser Ala Ala Asp Ile Leu Glu Gly Asp Lys Ser Trp Gly
20 25 30

Ile Gln Thr Lys
35

<210> 19
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 19
Gly Ile Gln Thr Lys Asn Ala Tyr Ser Ser Lys Asn Lys Gly Phe Thr
1 5 10 15

His Ser Leu Ala Val Ala Gly Lys Gln Gly Gly Phe Glu Gly Val Ala
20 25 30

Ile Tyr Thr His
35

<210> 20

<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 20
Gly Val Ala Ile Tyr Thr His Arg Asn Ser Ile Glu Thr Gln Val His
1 5 10 15

Lys Asp Ala Leu Lys Gly Val Gln Ser Tyr Asp Arg Phe Ile Ala Thr
20 25 30

Thr Glu Asp Gln
35

<210> 21
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 21
Ile Ala Thr Thr Glu Asp Gln Ser Ala Tyr Phe Val Met Gln Asp Glu
1 5 10 15

Cys Leu Asp Gly Tyr Asp Lys Cys Lys Thr Ser Pro Lys Arg Pro Ala
20 25 30

Thr Leu Ser Thr
35

<210> 22
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 22
Pro Ala Thr Leu Ser Thr Gln Arg Glu Thr Val Ser Val Ser Asp Tyr
1 5 10 15

Thr Gly Ala Asn Arg Ile Lys Pro Asn Pro Met Lys Tyr Glu Ser Gln
20 25 30

Ser Trp Phe Leu
35

<210> 23
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 23
Tyr Glu Ser Gln Ser Trp Phe Leu Arg Gly Gly Tyr His Phe Ser Glu
1 5 10 15

Gln His Tyr Ile Gly Gly Ile Phe Glu Phe Thr Gln Gln Lys Phe Asp
20 25 30

Ile Arg Asp Met
35

<210> 24
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 24
Lys Phe Asp Ile Arg Asp Met Thr Phe Pro Ala Tyr Leu Arg Pro Thr
1 5 10 15

Glu Asp Lys Asp Leu Gln Ser Arg Pro Phe Tyr Pro Lys Gln Asp Tyr
20 25 30

Gly Ala Tyr Gln
35

<210> 25
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 25
Asp Tyr Gly Ala Tyr Gln His Ile Gly Asp Gly Arg Gly Val Lys Tyr
1 5 10 15

Ala Ser Gly Leu Tyr Phe Asp Glu His His Arg Lys Gln Arg Val Gly
20 25 30

Ile Glu Tyr Ile
35

<210> 26
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 26
Gly Ile Glu Tyr Ile Tyr Glu Asn Lys Asn Lys Ala Gly Ile Ile Asp
1 5 10 15

Lys Ala Val Leu Ser Ala Asn Gln Gln Asn Ile Ile Leu Asp Ser Tyr
20 25 30

Met Arg His Thr
35

<210> 27
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 27
Asp Ser Tyr Met Arg His Thr His Cys Ser Leu Tyr Pro Asn Pro Ser

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  1               5                  10                  15

Lys Asn Cys Arg Pro Thr Leu Asp Lys Pro Tyr Ser Tyr Tyr His Ser
            20                  25                  30

Asp Arg Asn Val
        35


<210> 28
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 28
Ser Asp Arg Asn Val Tyr Lys Glu Lys His Asn Met Leu Gln Leu Asn
  1               5                  10                  15

Leu Glu Lys Lys Ile Gln Gln Asn Trp Leu Thr His Gln Ile Ala Phe
            20                  25                  30

Asn Leu Gly Phe
        35


<210> 29
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 29
Thr His Gln Ile Ala Phe Asn Leu Gly Phe Asp Asp Phe Thr Ser Ala
  1               5                  10                  15

Leu Gln His Lys Asp Tyr Leu Thr Arg Arg Val Ile Ala Thr Ala Ser
            20                  25                  30

Ser Ile Ser Glu
        35


<210> 30
<211> 37
<212> PRT
<213> Haemophilus influenzae

<400> 30
Thr Ala Ser Ser Ile Ser Glu Lys Arg Gly Glu Ala Arg Arg Asn Gly
  1               5                  10                  15

Leu Gln Ser Ser Pro Tyr Leu Tyr Pro Thr Pro Lys Ala Glu Leu Val
            20                  25                  30

Gly Gly Asp Leu Cys
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<210> 31
<211> 36
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<212> PRT
<213> Haemophilus influenzae

<400> 31
Leu Val Gly Gly Asp Leu Cys Asn Tyr Gln Gly Lys Ser Ser Asn Tyr
1 5 10 15

Ser Asp Cys Lys Val Arg Leu Ile Lys Gly Lys Asn Tyr Tyr Phe Ala
20 25 30

Ala Arg Asn Asn
35

<210> 32
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 32
Phe Ala Ala Arg Asn Asn Met Ala Leu Gly Lys Tyr Val Asp Leu Gly
1 5 10 15

Leu Gly Met Arg Tyr Asp Val Ser Arg Thr Lys Ala Asn Glu Ser Thr
20 25 30

Ile Ser Val Gly
35

<210> 33
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 33
Ser Thr Ile Ser Val Gly Lys Phe Lys Asn Phe Ser Trp Asn Thr Gly
1 5 10 15

Ile Val Ile Lys Pro Thr Glu Trp Leu Asp Leu Ser Tyr Arg Leu Ser
20 25 30

Thr Gly Phe Arg
35

<210> 34
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 34
Leu Ser Thr Gly Phe Arg Asn Pro Ser Phe Ala Glu Met Tyr Gly Trp
1 5 10 15

Arg Tyr Gly Gly Lys Asp Thr Asp Val Tyr Ile Gly Lys Phe Lys Pro
20 25 30

Glu Thr Ser Arg

35

<210> 35
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 35
Lys Pro Glu Thr Ser Arg Asn Gln Glu Phe Gly Leu Ala Leu Lys Gly
1 5 10 15

Asp Phe Gly Asn Ile Glu Ile Ser His Phe Ser Asn Ala Tyr Arg Asn
20 25 30

Leu Ile Ala Phe
35

<210> 36
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 36
Tyr Arg Asn Leu Ile Ala Phe Ala Glu Glu Leu Ser Lys Asn Gly Thr
1 5 10 15

Thr Gly Lys Gly Asn Tyr Gly Tyr His Asn Ala Gln Asn Ala Lys Leu
20 25 30

Val Gly Val Asn
35

<210> 37
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 37
Ala Lys Leu Val Gly Val Asn Ile Thr Ala Gln Leu Asp Phe Asn Gly
1 5 10 15

Leu Trp Lys Arg Ile Pro Tyr Gly Trp Tyr Ala Thr Phe Ala Tyr Asn
20 25 30

Arg Val Lys Val
35

<210> 38
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 38
Ala Tyr Asn Arg Val Lys Val Lys Asp Gln Lys Ile Asn Ala Gly Leu
1 5 10 15

Ala Ser Val Ser Ser Tyr Leu Phe Asp Ala Ile Gln Pro Ser Arg Tyr
20 25 30

Ile Ile Gly Leu
35

<210> 39
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 39
Ser Arg Tyr Ile Ile Gly Leu Asp Tyr Asp His Pro Ser Asn Thr Trp
1 5 10 15

Gly Ile Lys Thr Met Phe Thr Gln Ser Lys Ala Lys Ser Gln Asn Glu
20 25 30

Leu Leu Gly Lys
35

<210> 40
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 40
Asn Glu Leu Leu Gly Lys Arg Ala Leu Gly Asn Asn Ser Arg Asn Val
1 5 10 15

Lys Ser Thr Arg Lys Leu Thr Arg Ala Trp His Ile Leu Asp Val Ser
20 25 30

Gly Tyr Tyr Met
35

<210> 41
<211> 30
<212> PRT
<213> Haemophilus influenzae

<400> 41
Ser Gly Tyr Tyr Met Val Asn Arg Ser Ile Leu Phe Arg Leu Gly Val
1 5 10 15

Tyr Asn Leu Leu Asn Tyr Arg Tyr Val Thr Trp Glu Ala Val
20 25 30

<210> 42
<211> 23
<212> PRT
<213> Haemophilus influenzae

<400> 42

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Leu Leu Asn Tyr Arg Tyr Val Thr Trp Glu Ala Val Arg Gln Thr Ala
  1               5                  10                  15

Gln Gly Ala Glu Phe Asp Ile
            20
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<210> 43
<211> 9
<212> PRT
<213> Haemophilus influenzae

<400> 43

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Asp Asn Glu Val Thr Gly Leu Gly Lys
  1               5
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<210> 44
<211> 16
<212> PRT
<213> Haemophilus influenzae

<400> 44

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Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro Gly Ile
  1               5                  10                  15
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<210> 45
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 45

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Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro Gly Ile
  1               5                  10                  15

Ser Val Val Glu Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ser Ile Arg
            20                  25                  30

Gly Met Asp
         35
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<210> 46
<211> 19
<212> PRT
<213> Haemophilus influenzae

<400> 46

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Gly Ala Ile Asn Glu Ile Glu Tyr Glu Asn Val Lys Ala Val Glu Ile
  1               5                  10                  15

Ser Lys Gly
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<210> 47
<211> 7
<212> PRT

<213> Haemophilus influenzae

<400> 47
Gly Ala Leu Ala Gly Ser Val
1 5

<210> 48
<211> 15
<212> PRT
<213> Haemophilus influenzae

<400> 48
Ala Glu Thr Gln Ser Ile Lys Asp Thr Lys Glu Ala Ile Ser Cys
1 5 10 15

<210> 49
<211> 14
<212> PRT
<213> Haemophilus influenzae

<400> 49
Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn
1 5 10

<210> 50
<211> 31
<212> PRT
<213> Haemophilus influenzae

<400> 50
Leu Glu Gly Gly Phe Tyr Gly Pro Lys Gly Glu Glu Leu Gly Phe Arg
1 5 10 15

Phe Leu Ala Gly Asp Lys Lys Val Phe Gly Val Phe Ser Ala Lys
20 25 30

<210> 51
<211> 23
<212> PRT
<213> Haemophilus influenzae

<400> 51
Thr Val Gly Lys Lys Thr Tyr Gln Val Glu Ala Cys Cys Ser Asn Leu
1 5 10 15

Ser Tyr Val Lys Phe Gly Met
20

<210> 52
<211> 23
<212> PRT
<213> Haemophilus influenzae

<400> 52

Ala Thr Val Lys Gly Ala Phe Tyr Gly Pro Lys Ala Ser Glu Leu Gly
1 5 10 15

Gly Tyr Phe Thr Tyr Asn Gly
20

<210> 53
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 53
Met Lys Leu Ala Ala Leu Asn Leu Phe Asp Arg Asn Lys Pro Ser Leu
1 5 10 15

Leu Asn Glu Asp Ser Tyr Met Ile Phe Ser Ser Arg Ser Thr Ile Glu
20 25 30

Glu Asp Val
35

<210> 54
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 54
Ser Thr Ile Glu Glu Asp Val Lys Asn Asp Asn Gln Asn Gly Glu His
1 5 10 15

Pro Ile Asp Ser Ile Val Asp Pro Arg Ala Pro Asn Ser Asn Glu Asn
20 25 30

Arg His Gly
35

<210> 55
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 55
Ser Asn Glu Asn Arg His Gly Gln Lys Tyr Val Tyr Ser Gly Leu Tyr
1 5 10 15

Tyr Ile Gln Ser Trp Ser Leu Arg Asp Leu Pro Asn Lys Lys Phe Tyr
20 25 30

Ser Gly Tyr
35

<210> 56
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 56
Lys Lys Phe Tyr Ser Gly Tyr Tyr Gly Tyr Ala Tyr Tyr Phe Gly Asn
1 5 10 15

Thr Thr Ala Ser Ala Leu Pro Val Gly Gly Val Ala Thr Tyr Lys Gly
20 25 30

Thr Trp Ser
35

<210> 57
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 57
Thr Tyr Lys Gly Thr Trp Ser Phe Ile Thr Ala Ala Glu Asn Gly Lys
1 5 10 15

Asn Tyr Glu Leu Leu Arg Asn Ser Gly Gly Gly Gln Ala Tyr Ser Arg
20 25 30

Arg Ser Ala
35

<210> 58
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 58
Ala Tyr Ser Arg Arg Ser Ala Thr Pro Glu Asp Ile Asp Leu Asp Arg
1 5 10 15

Lys Thr Gly Leu Thr Ser Glu Phe Thr Val Asn Phe Gly Thr Lys Lys
20 25 30

Leu Thr Gly
35

<210> 59
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 59
Gly Thr Lys Lys Leu Thr Gly Gly Leu Tyr Tyr Asn Leu Arg Glu Thr
1 5 10 15

Asp Ala Asn Lys Ser Gln Asn Arg Thr His Lys Leu Tyr Asp Leu Glu
20 25 30

Ala Asp Val
35

<210> 60
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 60
Tyr Asp Leu Glu Ala Asp Val His Ser Asn Arg Phe Arg Gly Lys Val
1 5 10 15

Lys Pro Thr Lys Lys Glu Ser Ser Glu Glu His Pro Phe Thr Ser Glu
20 25 30

Gly Thr Leu
35

<210> 61
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 61
Phe Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Glu Gly
1 5 10 15

Gln Glu Leu Gly Gly Lys Phe Leu Ala His Asp Lys Lys Val Leu Gly
20 25 30

Val Phe Ser
35

<210> 62
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 62
Lys Val Leu Gly Val Phe Ser Ala Lys Glu Gln Gln Glu Thr Ser Glu
1 5 10 15

Asn Lys Lys Leu Pro Lys Glu Thr Leu Ile Asp Gly Lys Leu Thr Thr
20 25 30

Phe Lys Thr
35

<210> 63
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 63
Lys Leu Thr Thr Phe Lys Thr Thr Asn Ala Thr Ala Asn Ala Thr Thr
1 5 10 15

Asp Ala Thr Thr Ser Thr Thr Ala Ser Thr Lys Thr Asp Thr Thr Thr

20 25 30

Asn Ala Thr
35

<210> 64
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 64
Asp Thr Thr Thr Asn Ala Thr Ala Asn Thr Glu Asn Phe Thr Thr Lys
1 5 10 15

Asp Ile Pro Ser Leu Gly Glu Ala Asp Tyr Leu Leu Ile Asp Asn Tyr
20 25 30

Pro Val Pro
35

<210> 65
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 65
Ile Asp Asn Tyr Pro Val Pro Leu Phe Pro Glu Ser Gly Asp Phe Ile
1 5 10 15

Ser Ser Lys His His Thr Val Gly Lys Lys Thr Tyr Gln Val Glu Ala
20 25 30

Cys Cys Ser
35

<210> 66
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 66
Cys Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Ala Pro
1 5 10 15

Pro Lys Glu Glu Glu Lys Glu Lys Glu Lys Asp Lys Asp Lys Glu Lys
20 25 30

Glu Lys Gln Ala
35

<210> 67
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 67
Lys Glu Lys Asp Lys Asp Lys Glu Lys Glu Lys Gln Ala Thr Thr Ser
1 5 10 15

Ile Lys Thr Tyr Tyr Gln Phe Leu Leu Gly Leu Arg Thr Pro Ser Ser
20 25 30

Glu Ile Pro
35

<210> 68
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 68
Thr Pro Ser Ser Glu Ile Pro Lys Glu Gly Ser Ala Lys Tyr His Gly
1 5 10 15

Asn Trp Phe Gly Tyr Ile Ser Asp Gly Glu Thr Ser Tyr Ser Ala Ser
20 25 30

Gly Asp Lys
35

<210> 69
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 69
Tyr Ser Ala Ser Gly Asp Lys Glu Arg Ser Lys Asn Ala Val Ala Glu
1 5 10 15

Phe Asn Val Asn Phe Ala Glu Lys Thr Leu Thr Gly Glu Leu Lys Arg
20 25 30

His Asp Thr
35

<210> 70
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 70
Glu Leu Lys Arg His Asp Thr Gln Asn Pro Val Phe Lys Ile Asn Ala
1 5 10 15

Thr Phe Gln Ser Gly Lys Asn Asp Phe Thr Gly Thr Ala Thr Ala Lys
20 25 30

Asp Leu Ala
35

<210> 71
<211> 35
<212> PRT
<213> Haemophilus influenzae

<400> 71
Ala Thr Ala Lys Asp Leu Ala Ile Asp Gly Lys Asn Thr Gln Gly Thr
1 5 10 15

Ser Lys Val Asn Phe Thr Ala Thr Val Asn Gly Ala Phe Tyr Gly Pro
20 25 30

His Ala Thr
35

<210> 72
<211> 26
<212> PRT
<213> Haemophilus influenzae

<400> 72
Phe Tyr Gly Pro His Ala Thr Glu Leu Gly Gly Tyr Phe Thr Tyr Asn
1 5 10 15

Gly Asn Asn Pro Thr Asp Lys Asn Ser Ser
20 25

<210> 73
<211> 31
<212> PRT
<213> Haemophilus influenzae

<400> 73
Cys Pro Thr Asp Lys Asn Ser Ser Ser Asn Ser Glu Lys Ala Arg Ala
1 5 10 15

Ala Val Val Phe Gly Ala Lys Lys Gln Gln Val Glu Thr Thr Lys
20 25 30

<210> 74
<211> 8
<212> PRT
<213> Haemophilus influenzae

<400> 74
Leu Glu Gly Gly Phe Tyr Gly Pro
1 5

<210> 75
<211> 8
<212> PRT
<213> Haemophilus influenzae

<400> 75
Cys Ser Gly Gly Gly Ser Phe Asp

1 5

<210> 76
<211> 6
<212> PRT
<213> Haemophilus influenzae

<400> 76
Tyr Val Tyr Ser Gly Leu
1 5

<210> 77
<211> 11
<212> PRT
<213> Haemophilus influenzae

<400> 77
Cys Cys Ser Asn Leu Ser Tyr Val Lys Phe Gly
1 5 10

<210> 78
<211> 7
<212> PRT
<213> Haemophilus influenzae

<400> 78
Phe Leu Leu Gly His Arg Thr
1 5

<210> 79
<211> 6
<212> PRT
<213> Haemophilus influenzae

<400> 79
Glu Phe Asn Val Asp Phe
1 5

<210> 80
<211> 7
<212> PRT
<213> Haemophilus influenzae

<400> 80
Asn Ala Phe Thr Gly Thr Ala
1 5

<210> 81
<211> 7
<212> PRT
<213> Haemophilus influenzae

<400> 81

Val Asn Gly Ala Phe Tyr Gly
1 5

<210> 82
<211> 6
<212> PRT
<213> Haemophilus influenzae

<400> 82
Glu Leu Gly Gly Tyr Phe
1 5

<210> 83
<211> 6
<212> PRT
<213> Haemophilus influenzae

<400> 83
Val Val Phe Gly Ala Arg
1 5

<210> 84
<211> 6
<212> PRT
<213> Haemophilus influenzae

<400> 84
Val Val Phe Gly Ala Lys
1 5

<210> 85
<211> 7
<212> PRT
<213> Haemophilus influenzae

<400> 85
Leu Glu Gly Gly Phe Tyr Gly
1 5

<210> 86
<211> 103
<212> DNA
<213> Haemophilus influenzae

<400> 86
tatggaaact caaagtataa aagatacaaa agaagctata tcatctgaag tggacactca 60
aagtacagaa gattcagaat tagaaactat ctcagtcact gca 103

<210> 87
<211> 97
<212> DNA
<213> Haemophilus influenzae

<400> 87
acctttgagt ttcatatttt ctatgttttc ttcgatatag tagacttcac ctgtgagttt 60
catgtcttct aagtcttaat ctttgataga gtcagtg 97

<210> 88
<211> 115
<212> DNA
<213> Haemophilus influenzae

<400> 88
tatgaaagct actaaactgg ttctgggtgc tgttatcctg ggttccactc tgctggctgg 60
ttgtagcgga ggtggttgtt ttgatgtaga taacgtctct aataccccct cttct 115

<210> 89
<211> 116
<212> DNA
<213> Haemophilus influenzae

<400> 89
actttcgatg atttgaccaa gacccacgac aataggaccc aaggtgagac gaccgaccaa 60
catcgcctcc accaacaaaa ctacatctat tgcagagatt atgggggaga agattt 116

<210> 90
<211> 109
<212> DNA
<213> Haemophilus influenzae

<400> 90
tatgcgatat ctggcaacat tgttgttatc tctggcggtg ttaatcaccg ctggttgtag 60
cggaggtggt tcttttgatg tagataacgt ctctaatacc ccctcttct 109

<210> 91
<211> 110
<212> DNA
<213> Haemophilus influenzae

<400> 91
acgctataga ccgttgtaac aacaatagag accgccacaa ttagtggcga ccaacatcgc 60
ctccaccaag aaaactacat ctattgcaga gattatgggg gagaagattt 110

<210> 92
<211> 117
<212> DNA
<213> Haemophilus influenzae

<400> 92
tatgcaactg aacaaagtgc tgaaagggct gatgattgct ctgcctgtta tggcaatgct 60
ggttgtagcg gaggtggttc ttttgatgta gataacgtct ctaatacccc ctcttct 117

<210> 93
<211> 119
<212> DNA
<213> Haemophilus influenzae

<400> 93
acgttgactt gtttcacgac tttcccgact actaacgaga cggacaatac cgttaacgac 60
caacatcgcc tccaccaaga aaactacatc tattgcagag attatggggg agaagattt 119

<210> 94
<211> 908
<212> PRT
<213> Haemophilus influenzae

<400> 94
Met Gln Gln Gln His Leu Phe Arg Leu Asn Ile Leu Cys Leu Ser Leu
1 5 10 15

Met Thr Ala Leu Pro Val Tyr Ala Glu Asn Val Gln Ala Glu Gln Ala
20 25 30

Gln Glu Lys Gln Leu Asp Thr Ile Gln Val Lys Ala Lys Lys Gln Lys
35 40 45

Thr Arg Arg Asp Asn Glu Val Thr Gly Leu Gly Lys Leu Val Lys Ser
50 55 60

Ser Asp Thr Leu Ser Lys Glu Gln Val Leu Asn Ile Arg Asp Leu Thr
65 70 75 80

Arg Tyr Asp Pro Gly Ile Ala Val Val Glu Gln Gly Arg Gly Ala Ser
85 90 95

Ser Gly Tyr Ser Ile Arg Gly Met Asp Lys Asn Arg Val Ser Leu Thr
100 105 110

Val Asp Gly Val Ser Gln Ile Gln Ser Tyr Thr Ala Gln Ala Ala Leu
115 120 125

Gly Gly Thr Arg Thr Ala Gly Ser Ser Gly Ala Ile Asn Glu Ile Glu
130 135 140

Tyr Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly Ser Asn Ser Ser
145 150 155 160

Glu Tyr Gly Asn Gly Ala Leu Ala Gly Ser Val Ala Phe Gln Thr Lys
165 170 175

Thr Ala Ala Asp Ile Ile Gly Glu Gly Lys Gln Trp Gly Ile Gln Ser
180 185 190

Lys Thr Ala Tyr Ser Gly Lys Asp His Ala Leu Thr Gln Ser Leu Ala
195 200 205

Leu Ala Gly Arg Ser Gly Gly Ala Glu Ala Leu Leu Ile Tyr Thr Lys
210 215 220

Arg Arg Gly Arg Glu Ile His Ala His Lys Asp Ala Gly Lys Gly Val
225 230 235 240

Gln Ser Phe Asn Arg Leu Val Leu Asp Glu Asp Lys Lys Glu Gly Gly
245 250 255

Ser Gln Tyr Arg Tyr Phe Ile Val Glu Glu Glu Cys His Asn Gly Tyr
260 265 270

Ala Ala Cys Lys Asn Lys Leu Lys Glu Asp Ala Ser Val Lys Asp Glu
275 280 285

Arg Lys Thr Val Ser Thr Gln Asp Tyr Thr Gly Ser Asn Arg Leu Leu
290 295 300

Ala Asn Pro Leu Glu Tyr Gly Ser Gln Ser Trp Leu Phe Arg Pro Gly
305 310 315 320

Trp His Leu Asp Asn Arg His Tyr Val Gly Ala Val Leu Glu Arg Thr
325 330 335

Gln Gln Thr Phe Asp Thr Arg Asp Met Thr Val Pro Ala Tyr Phe Thr
340 345 350

Ser Glu Asp Tyr Val Pro Gly Ser Leu Lys Gly Leu Gly Lys Tyr Ser
355 360 365

Gly Asp Asn Lys Ala Glu Arg Leu Phe Val Gln Gly Glu Gly Ser Thr
370 375 380

Leu Gln Gly Ile Gly Tyr Gly Thr Gly Val Phe Tyr Asp Glu Arg His
385 390 395 400

Thr Lys Asn Arg Tyr Gly Val Glu Tyr Val Tyr His Asn Ala Asp Lys
405 410 415

Asp Thr Trp Ala Asp Tyr Ala Arg Leu Ser Tyr Asp Arg Gln Gly Ile
420 425 430

Asp Leu Asp Asn Arg Leu Gln Gln Thr His Cys Ser His Asp Gly Ser
435 440 445

Asp Lys Asn Cys Arg Pro Asp Gly Asn Lys Pro Tyr Ser Phe Tyr Lys
450 455 460

Ser Asp Arg Met Ile Tyr Glu Glu Ser Arg Asn Leu Phe Gln Ala Val
465 470 475 480

Phe Lys Lys Ala Phe Asp Thr Ala Lys Ile Arg His Asn Leu Ser Ile
485 490 495

Asn Leu Gly Tyr Asp Arg Phe Lys Ser Gln Leu Ser His Ser Asp Tyr
500 505 510

Tyr Leu Gln Asn Ala Val Gln Ala Tyr Asp Leu Ile Thr Pro Lys Lys
515 520 525

Pro Pro Phe Pro Asn Gly Ser Lys Asp Asn Pro Tyr Arg Val Ser Ile
530 535 540

Gly Lys Thr Thr Val Asn Thr Ser Pro Ile Cys Arg Phe Gly Asn Asn
545 550 555 560

Thr Tyr Thr Asp Cys Thr Pro Arg Asn Ile Gly Gly Asn Gly Tyr Tyr

565 570 575

Ala Ala Val Gln Asp Asn Val Arg Leu Gly Arg Trp Ala Asp Val Gly
580 585 590

Ala Gly Ile Arg Tyr Asp Tyr Arg Ser Thr His Ser Glu Asp Lys Ser
595 600 605

Val Ser Thr Gly Thr His Arg Asn Leu Ser Trp Asn Ala Gly Val Val
610 615 620

Leu Lys Pro Phe Thr Trp Met Asp Leu Thr Tyr Arg Ala Ser Thr Gly
625 630 635 640

Phe Arg Leu Pro Ser Phe Ala Glu Met Tyr Gly Trp Arg Ala Gly Glu
645 650 655

Ser Leu Lys Thr Leu Asp Leu Lys Pro Glu Lys Ser Phe Asn Arg Glu
660 665 670

Ala Gly Ile Val Phe Lys Gly Asp Phe Gly Asn Leu Glu Ala Ser Tyr
675 680 685

Phe Asn Asn Ala Tyr Arg Asp Leu Ile Ala Phe Gly Tyr Glu Thr Arg
690 695 700

Thr Gln Asn Gly Gln Thr Ser Ala Ser Gly Asp Pro Gly Tyr Arg Asn
705 710 715 720

Ala Gln Asn Ala Arg Ile Ala Gly Ile Asn Ile Leu Gly Lys Ile Asp
725 730 735

Trp His Gly Val Trp Gly Gly Leu Pro Asp Gly Leu Tyr Ser Thr Leu
740 745 750

Ala Tyr Asn Arg Ile Lys Val Lys Asp Ala Asp Ile Arg Ala Asp Arg
755 760 765

Thr Phe Val Thr Ser Tyr Leu Phe Asp Ala Val Gln Pro Ser Arg Tyr
770 775 780

Val Leu Gly Leu Gly Tyr Asp His Pro Asp Gly Ile Trp Gly Ile Asn
785 790 795 800

Thr Met Phe Thr Tyr Ser Lys Ala Lys Ser Val Asp Glu Leu Leu Gly
805 810 815

Ser Gln Ala Leu Leu Asn Gly Asn Ala Asn Ala Lys Lys Ala Ala Ser
820 825 830

Arg Arg Thr Arg Pro Trp Tyr Val Thr Asp Val Ser Gly Tyr Tyr Asn
835 840 845

Ile Lys Lys His Leu Thr Leu Arg Ala Gly Val Tyr Asn Leu Leu Asn
850 855 860

Tyr Arg Tyr Val Thr Trp Glu Asn Val Arg Gln Thr Ala Gly Gly Ala
865 870 875 880

Val Asn Gln His Lys Asn Val Gly Val Tyr Asn Arg Tyr Ala Ala Pro
885 890 895

Gly Arg Asn Tyr Thr Phe Ser Leu Glu Met Lys Phe
900 905

<210> 95
<211> 911
<212> PRT
<213> Haemophilus influenzae

<400> 95
Met Gln Gln Gln His Leu Phe Arg Leu Asn Ile Leu Cys Leu Ser Leu
1 5 10 15

Met Thr Ala Leu Pro Ala Tyr Ala Glu Asn Val Gln Ala Gly Gln Ala
20 25 30

Gln Glu Lys Gln Leu Asp Thr Ile Gln Val Lys Ala Lys Lys Gln Lys
35 40 45

Thr Arg Arg Asp Asn Glu Val Thr Gly Leu Gly Lys Leu Val Lys Thr
50 55 60

Ala Asp Thr Leu Ser Lys Glu Gln Val Leu Asp Ile Arg Asp Leu Thr
65 70 75 80

Arg Tyr Asp Pro Gly Ile Ala Val Val Glu Gln Gly Arg Gly Ala Ser
85 90 95

Ser Gly Tyr Ser Ile Arg Gly Met Asp Lys Asn Arg Val Ser Leu Thr
100 105 110

Val Asp Gly Leu Ala Gln Ile Gln Ser Tyr Thr Ala Gln Ala Ala Leu
115 120 125

Gly Gly Thr Arg Thr Ala Gly Ser Ser Gly Ala Ile Asn Glu Ile Glu
130 135 140

Tyr Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly Ser Asn Ser Val
145 150 155 160

Glu Gln Gly Ser Gly Ala Leu Ala Gly Ser Val Ala Phe Gln Thr Lys
165 170 175

Thr Ala Asp Asp Val Ile Gly Glu Gly Arg Gln Trp Gly Ile Gln Ser
180 185 190

Lys Thr Ala Tyr Ser Gly Lys Asn Arg Gly Leu Thr Gln Ser Ile Ala
195 200 205

Leu Ala Gly Arg Ile Gly Gly Ala Glu Ala Leu Leu Ile His Thr Gly
210 215 220

Arg Arg Ala Gly Glu Ile Arg Ala His Glu Asp Ala Gly Arg Gly Val
225 230 235 240

Gln Ser Phe Asn Arg Leu Val Pro Val Glu Asp Ser Ser Glu Tyr Ala

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                245                 250                 255

Tyr Phe Ile Val Glu Asp Glu Cys Glu Gly Lys Asn Tyr Glu Thr Cys
            260                 265                 270

Lys Ser Lys Pro Lys Lys Asp Val Val Gly Lys Asp Glu Arg Gln Thr
        275                 280                 285

Val Ser Thr Arg Asp Tyr Thr Gly Pro Asn Arg Phe Leu Ala Asp Pro
    290                 295                 300

Leu Ser Tyr Glu Ser Arg Ser Trp Leu Phe Arg Pro Gly Phe Arg Phe
305                 310                 315                 320

Glu Asn Lys Arg His Tyr Ile Gly Gly Ile Leu Glu His Thr Gln Gln
                325                 330                 335

Thr Phe Asp Thr Arg Asp Met Thr Val Pro Ala Phe Leu Thr Lys Ala
            340                 345                 350

Val Phe Asp Ala Asn Ser Lys Gln Ala Gly Ser Leu Pro Gly Asn Gly
        355                 360                 365

Lys Tyr Ala Gly Asn His Lys Tyr Gly Gly Leu Phe Thr Asn Gly Glu
    370                 375                 380

Asn Gly Ala Leu Val Gly Ala Glu Tyr Gly Thr Gly Val Phe Tyr Asp
385                 390                 395                 400

Glu Thr His Thr Lys Ser Arg Tyr Gly Leu Glu Tyr Val Tyr Thr Asn
                405                 410                 415

Ala Asp Lys Asp Thr Trp Ala Asp Tyr Ala Arg Leu Ser Tyr Asp Arg
            420                 425                 430

Gln Gly Ile Gly Leu Asp Asn His Phe Gln Gln Thr His Cys Ser Ala
        435                 440                 445

Asp Gly Ser Asp Lys Tyr Cys Arg Pro Ser Ala Asp Lys Pro Phe Ser
    450                 455                 460

Tyr Tyr Lys Ser Asp Arg Val Ile Tyr Gly Glu Ser His Arg Leu Leu
465                 470                 475                 480

Gln Ala Ala Phe Lys Lys Ser Phe Asp Thr Ala Lys Ile Arg His Asn
                485                 490                 495

Leu Ser Val Asn Leu Gly Phe Asp Arg Phe Asp Ser Asn Leu Arg His
            500                 505                 510

Gln Asp Tyr Tyr Tyr Gln His Ala Asn Arg Ala Tyr Ser Ser Lys Thr
        515                 520                 525

Pro Pro Lys Thr Ala Asn Pro Asn Gly Asp Lys Ser Lys Pro Tyr Trp
    530                 535                 540

Val Ser Ile Gly Gly Gly Asn Val Val Thr Gly Gln Ile Cys Leu Phe
545                 550                 555                 560
```

```
Gly Asn Asn Thr Tyr Thr Asp Cys Thr Pro Arg Ser Ile Asn Gly Lys
                565                 570                 575

Ser Tyr Tyr Ala Ala Val Arg Asp Asn Val Arg Leu Gly Arg Trp Ala
            580                 585                 590

Asp Val Gly Ala Gly Leu Arg Tyr Asp Tyr Arg Ser Thr His Ser Asp
        595                 600                 605

Asp Gly Ser Val Ser Thr Gly Thr His Arg Thr Leu Ser Trp Asn Ala
    610                 615                 620

Gly Ile Val Leu Lys Pro Ala Asp Trp Leu Asp Leu Thr Tyr Arg Thr
625                 630                 635                 640

Ser Thr Gly Phe Arg Leu Pro Ser Phe Ala Glu Met Tyr Gly Trp Arg
                645                 650                 655

Ser Gly Val Gln Ser Lys Ala Val Lys Ile Asp Pro Glu Lys Ser Phe
            660                 665                 670

Asn Lys Glu Ala Gly Ile Val Phe Lys Gly Asp Phe Gly Asn Leu Glu
        675                 680                 685

Ala Ser Trp Phe Asn Asn Ala Tyr Arg Asp Leu Ile Val Arg Gly Tyr
    690                 695                 700

Glu Ala Gln Ile Lys Asn Gly Lys Glu Glu Ala Lys Gly Asp Pro Ala
705                 710                 715                 720

Tyr Leu Asn Ala Gln Ser Ala Arg Ile Thr Gly Ile Asn Ile Leu Gly
                725                 730                 735

Lys Ile Asp Trp Asn Gly Val Trp Asp Lys Leu Pro Glu Gly Trp Tyr
            740                 745                 750

Ser Thr Phe Ala Tyr Asn Arg Val His Val Arg Asp Ile Lys Lys Arg
        755                 760                 765

Ala Asp Arg Thr Asp Ile Gln Ser His Leu Phe Asp Ala Ile Gln Pro
    770                 775                 780

Ser Arg Tyr Val Val Gly Leu Gly Tyr Asp Gln Pro Glu Gly Lys Trp
785                 790                 795                 800

Gly Val Asn Gly Met Leu Thr Tyr Ser Lys Ala Lys Glu Ile Thr Glu
                805                 810                 815

Leu Leu Gly Ser Arg Ala Leu Leu Asn Gly Asn Ser Arg Asn Thr Lys
            820                 825                 830

Ala Thr Ala Arg Arg Thr Arg Pro Trp Tyr Ile Val Asp Val Ser Gly
        835                 840                 845

Tyr Tyr Thr Ile Lys Lys His Phe Thr Leu Arg Ala Gly Val Tyr Asn
    850                 855                 860

Leu Leu Asn Tyr Arg Tyr Val Thr Trp Glu Asn Val Arg Gln Thr Ala
865                 870                 875                 880
```

```
Gly Gly Ala Val Asn Gln His Lys Asn Val Gly Val Tyr Asn Arg Tyr
                885                 890                 895

Ala Ala Pro Gly Arg Asn Tyr Thr Phe Ser Leu Glu Met Lys Phe
            900                 905                 910
```

<210> 96
<211> 915
<212> PRT
<213> Haemophilus influenzae

<400> 96

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Met Gln Gln Gln His Leu Phe Arg Leu Asn Ile Leu Cys Leu Ser Leu
  1               5                  10                  15

Met Thr Ala Leu Pro Ala Tyr Ala Glu Asn Val Gln Ala Gly Gln Ala
            20                  25                  30

Gln Glu Lys Gln Leu Asp Thr Ile Gln Val Lys Ala Lys Lys Gln Lys
        35                  40                  45

Thr Arg Arg Asp Asn Glu Val Thr Gly Leu Gly Lys Leu Val Lys Thr
    50                  55                  60

Ala Asp Thr Leu Ser Lys Glu Gln Val Leu Asp Ile Arg Asp Leu Thr
65                  70                  75                  80

Arg Tyr Asp Pro Gly Ile Ala Val Val Glu Gln Gly Arg Gly Ala Ser
                85                  90                  95

Ser Gly Tyr Ser Ile Arg Gly Met Asp Lys Asn Arg Val Ser Leu Thr
            100                 105                 110

Val Asp Gly Leu Ala Gln Ile Gln Ser Tyr Thr Ala Gln Ala Ala Leu
        115                 120                 125

Gly Gly Thr Arg Thr Ala Gly Ser Ser Gly Ala Ile Asn Glu Ile Glu
    130                 135                 140

Tyr Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly Ser Asn Ser Val
145                 150                 155                 160

Glu Gln Gly Ser Gly Ala Leu Ala Gly Ser Val Ala Phe Gln Thr Lys
                165                 170                 175

Thr Ala Asp Asp Val Ile Gly Glu Gly Arg Gln Trp Gly Ile Gln Ser
            180                 185                 190

Lys Thr Ala Tyr Ser Gly Lys Asn Arg Gly Leu Thr Gln Ser Ile Ala
        195                 200                 205

Leu Ala Gly Arg Ile Gly Gly Ala Glu Ala Leu Leu Ile Arg Thr Gly
    210                 215                 220

Arg His Ala Gly Glu Ile Arg Ala His Glu Ala Ala Gly Arg Gly Val
225                 230                 235                 240
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```
Gln Ser Phe Asn Arg Leu Ala Pro Val Asp Asp Gly Ser Lys Tyr Ala
                245                 250                 255

Tyr Phe Ile Val Glu Glu Glu Cys Lys Asn Gly Gly His Glu Lys Cys
            260                 265                 270

Lys Ala Asn Pro Lys Lys Asp Val Val Gly Glu Asp Lys Arg Gln Thr
        275                 280                 285

Val Ser Thr Arg Asp Tyr Thr Gly Pro Asn Arg Phe Leu Ala Asp Pro
    290                 295                 300

Leu Ser Tyr Glu Ser Arg Ser Trp Leu Phe Arg Pro Gly Phe Arg Phe
305                 310                 315                 320

Glu Asn Lys Arg His Tyr Ile Gly Gly Ile Leu Glu Arg Thr Gln Gln
                325                 330                 335

Thr Phe Asp Thr Arg Asp Met Thr Val Pro Ala Phe Leu Thr Lys Ala
            340                 345                 350

Val Phe Asp Ala Asn Gln Lys Gln Ala Gly Ser Leu Arg Gly Asn Gly
        355                 360                 365

Lys Tyr Ala Gly Asn His Lys Tyr Gly Gly Leu Phe Thr Ser Gly Glu
    370                 375                 380

Asn Asn Ala Pro Val Gly Ala Glu Tyr Gly Thr Gly Val Phe Tyr Asp
385                 390                 395                 400

Glu Thr His Thr Lys Ser Arg Tyr Gly Leu Glu Tyr Val Tyr Thr Asn
                405                 410                 415

Ala Asp Lys Asp Thr Trp Ala Asp Tyr Ala Arg Leu Ser Tyr Asp Arg
            420                 425                 430

Gln Gly Ile Gly Leu Asp Asn His Phe Gln Gln Thr His Cys Ser Ala
        435                 440                 445

Asp Gly Ser Asp Lys Tyr Cys Arg Pro Ser Ala Asp Lys Pro Phe Ser
    450                 455                 460

Tyr Tyr Lys Ser Asp Arg Val Ile Tyr Gly Glu Ser His Lys Leu Leu
465                 470                 475                 480

Gln Ala Ala Phe Lys Lys Ser Phe Asp Thr Ala Lys Ile Arg His Asn
                485                 490                 495

Leu Ser Val Asn Leu Gly Tyr Asp Arg Phe Gly Ser Asn Leu Arg His
            500                 505                 510

Gln Asp Tyr Tyr Tyr Gln Ser Ala Asn Arg Ala Tyr Ser Leu Lys Thr
        515                 520                 525

Pro Pro Gln Asn Asn Gly Lys Lys Thr Ser Pro Asn Gly Arg Glu Lys
    530                 535                 540

Asn Pro Tyr Trp Val Ser Ile Gly Arg Gly Asn Val Val Thr Arg Gln
545                 550                 555                 560
```

Ile Cys Leu Phe Gly Asn Asn Thr Tyr Thr Asp Cys Thr Pro Arg Ser
565 570 575

Ile Asn Gly Lys Ser Tyr Tyr Ala Ala Val Arg Asp Asn Val Arg Leu
580 585 590

Gly Arg Trp Ala Asp Val Gly Ala Gly Leu Arg Tyr Asp Tyr Arg Ser
595 600 605

Thr His Ser Asp Asp Gly Ser Val Ser Thr Gly Thr His Arg Thr Leu
610 615 620

Ser Trp Asn Ala Gly Ile Val Leu Lys Pro Ala Asp Trp Leu Asp Leu
625 630 635 640

Thr Tyr Arg Thr Ser Thr Gly Phe Arg Leu Pro Ser Phe Ala Glu Met
645 650 655

Tyr Gly Trp Arg Ser Gly Asp Lys Ile Lys Ala Val Lys Ile Asp Pro
660 665 670

Glu Lys Ser Phe Asn Lys Glu Ala Gly Ile Val Phe Lys Gly Asp Phe
675 680 685

Gly Asn Leu Glu Ala Ser Trp Phe Asn Asn Ala Tyr Arg Asp Leu Ile
690 695 700

Val Arg Gly Tyr Glu Ala Gln Ile Lys Asp Gly Lys Glu Gln Val Lys
705 710 715 720

Gly Asn Pro Ala Tyr Leu Asn Ala Gln Ser Ala Arg Ile Thr Gly Ile
725 730 735

Asn Ile Leu Gly Lys Ile Asp Trp Asn Gly Val Trp Asp Lys Leu Pro
740 745 750

Glu Gly Trp Tyr Ser Thr Phe Ala Tyr Asn Arg Val Arg Val Arg Asp
755 760 765

Ile Lys Lys Arg Ala Asp Arg Thr Asp Ile Gln Ser His Leu Phe Asp
770 775 780

Ala Ile Gln Pro Ser Arg Tyr Val Val Gly Ser Gly Tyr Asp Gln Pro
785 790 795 800

Glu Gly Lys Trp Gly Val Asn Gly Met Leu Thr Tyr Ser Lys Ala Lys
805 810 815

Glu Ile Thr Glu Leu Leu Gly Ser Arg Ala Leu Leu Asn Gly Asn Ser
820 825 830

Arg Asn Thr Lys Ala Thr Ala Arg Arg Thr Arg Pro Trp Tyr Ile Val
835 840 845

Asp Val Ser Gly Tyr Tyr Thr Val Lys Lys His Phe Thr Leu Arg Ala
850 855 860

Gly Val Tyr Asn Leu Leu Asn His Arg Tyr Val Thr Trp Glu Asn Val

865 870 875 880

Arg Gln Thr Ala Ala Gly Ala Val Asn Gln His Lys Asn Val Gly Val
885 890 895

Tyr Asn Arg Tyr Ala Ala Pro Gly Arg Asn Tyr Thr Phe Ser Leu Glu
900 905 910

Met Lys Phe
915

<210> 97
<211> 598
<212> PRT
<213> Haemophilus influenzae

<400> 97
Met Asn Asn Pro Leu Val Asn Gln Ala Ala Met Val Leu Pro Val Phe
1 5 10 15

Leu Leu Ser Ala Cys Leu Gly Gly Gly Gly Ser Phe Asp Leu Asp Ser
20 25 30

Val Glu Thr Val Gln Asp Met His Ser Lys Pro Lys Tyr Glu Asp Glu
35 40 45

Lys Ser Gln Pro Glu Ser Gln Gln Asp Val Ser Glu Asn Ser Gly Ala
50 55 60

Ala Tyr Gly Phe Ala Val Lys Leu Pro Arg Arg Asn Ala His Phe Asn
65 70 75 80

Pro Lys Tyr Lys Glu Lys His Lys Pro Leu Gly Ser Met Asp Trp Lys
85 90 95

Lys Leu Gln Arg Gly Glu Pro Asn Ser Phe Ser Glu Arg Asp Glu Leu
100 105 110

Glu Lys Lys Arg Gly Ser Ser Glu Leu Ile Glu Ser Lys Trp Glu Asp
115 120 125

Gly Gln Ser Arg Val Val Gly Tyr Thr Asn Phe Thr Tyr Val Arg Ser
130 135 140

Gly Tyr Val Tyr Leu Asn Lys Asn Asn Ile Asp Ile Lys Asn Asn Ile
145 150 155 160

Val Leu Phe Gly Pro Asp Gly Tyr Leu Tyr Tyr Lys Gly Lys Glu Pro
165 170 175

Ser Lys Glu Leu Pro Ser Glu Lys Ile Thr Tyr Lys Gly Thr Trp Asp
180 185 190

Tyr Val Thr Asp Ala Met Glu Lys Gln Arg Phe Glu Gly Leu Gly Ser
195 200 205

Ala Ala Gly Gly Asp Lys Ser Gly Ala Leu Ser Ala Leu Glu Glu Gly
210 215 220

```
Val Leu Arg Asn Gln Ala Glu Ala Ser Ser Gly His Thr Asp Phe Gly
225                 230                 235                 240

Met Thr Ser Glu Phe Glu Val Asp Phe Ser Asp Lys Thr Ile Lys Gly
                245                 250                 255

Thr Leu Tyr Arg Asn Asn Arg Ile Thr Gln Asn Asn Ser Glu Asn Lys
            260                 265                 270

Gln Ile Lys Thr Thr Arg Tyr Thr Ile Gln Ala Thr Leu His Gly Asn
        275                 280                 285

Arg Phe Lys Gly Lys Ala Leu Ala Ala Asp Lys Gly Ala Thr Asn Gly
    290                 295                 300

Ser His Pro Phe Ile Ser Asp Ser Asp Ser Leu Glu Gly Gly Phe Tyr
305                 310                 315                 320

Gly Pro Lys Gly Glu Glu Leu Ala Gly Lys Phe Leu Ser Asn Asp Asn
                325                 330                 335

Lys Val Ala Ala Val Phe Gly Ala Lys Gln Lys Asp Lys Lys Asp Gly
            340                 345                 350

Glu Asn Ala Ala Gly Pro Ala Thr Glu Val Ile Asp Ala Tyr Arg Ile
        355                 360                 365

Thr Gly Glu Glu Phe Lys Lys Glu Gln Ile Asp Ser Phe Gly Asp Val
    370                 375                 380

Lys Lys Leu Leu Val Asp Gly Val Glu Leu Ser Leu Leu Pro Ser Glu
385                 390                 395                 400

Gly Asn Lys Ala Ala Phe Gln His Glu Ile Glu Gln Asn Gly Val Lys
                405                 410                 415

Ala Thr Val Cys Cys Ser Asn Leu Asp Tyr Met Ser Phe Gly Lys Leu
            420                 425                 430

Ser Lys Glu Asn Lys Asp Asp Met Phe Leu Gln Gly Val Arg Thr Pro
        435                 440                 445

Val Ser Asp Val Ala Ala Arg Thr Glu Ala Asn Ala Lys Tyr Arg Gly
    450                 455                 460

Thr Trp Tyr Gly Tyr Ile Ala Asn Gly Thr Ser Trp Ser Gly Glu Ala
465                 470                 475                 480

Ser Asn Gln Glu Gly Gly Asn Arg Ala Glu Phe Asp Val Asp Phe Ser
                485                 490                 495

Thr Lys Lys Ile Ser Gly Thr Leu Thr Ala Lys Asp Arg Thr Ser Pro
            500                 505                 510

Ala Phe Thr Ile Thr Ala Met Ile Lys Asp Asn Gly Phe Ser Gly Val
        515                 520                 525

Ala Lys Thr Gly Glu Asn Gly Phe Ala Leu Asp Pro Gln Asn Thr Gly
```

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    530                 535                 540

Asn Ser His Tyr Thr His Ile Glu Ala Thr Val Ser Gly Gly Phe Tyr
545                 550                 555                 560

Gly Lys Asn Ala Ile Glu Met Gly Gly Ser Phe Ser Phe Pro Gly Asn
                565                 570                 575

Ala Pro Glu Gly Lys Gln Glu Lys Ala Ser Val Val Phe Gly Ala Lys
            580                 585                 590

Arg Gln Gln Leu Val Gln
        595
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<210> 98
<211> 711
<212> PRT
<213> Haemophilus influenzae

<400> 98

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Met Asn Asn Pro Leu Val Asn Gln Ala Ala Met Val Leu Pro Val Phe
  1               5                  10                  15

Leu Leu Ser Ala Cys Leu Gly Gly Gly Gly Ser Phe Asp Leu Asp Ser
            20                  25                  30

Val Asp Thr Glu Ala Pro Arg Pro Ala Pro Lys Tyr Gln Asp Val Ser
        35                  40                  45

Ser Glu Lys Pro Gln Ala Gln Lys Asp Gln Gly Gly Tyr Gly Phe Ala
    50                  55                  60

Met Arg Leu Lys Arg Arg Asn Trp Tyr Pro Gly Ala Glu Glu Ser Glu
65                  70                  75                  80

Val Lys Leu Asn Glu Ser Asp Trp Glu Ala Thr Gly Leu Pro Thr Lys
                85                  90                  95

Pro Lys Glu Leu Pro Lys Arg Gln Lys Ser Val Ile Glu Lys Val Glu
            100                 105                 110

Thr Asp Gly Asp Ser Asp Ile Tyr Ser Ser Pro Tyr Leu Thr Pro Ser
        115                 120                 125

Asn His Gln Asn Gly Ser Ala Gly Asn Gly Val Asn Gln Pro Lys Asn
    130                 135                 140

Gln Ala Thr Gly His Glu Asn Phe Gln Tyr Val Tyr Ser Gly Trp Phe
145                 150                 155                 160

Tyr Lys His Ala Ala Ser Glu Lys Asp Phe Ser Asn Lys Lys Ile Lys
                165                 170                 175

Ser Gly Asp Asp Gly Tyr Ile Phe Tyr His Gly Glu Lys Pro Ser Arg
            180                 185                 190

Gln Leu Pro Ala Ser Gly Lys Val Ile Tyr Lys Gly Val Trp His Phe
        195                 200                 205
```

Val Thr Asp Thr Lys Lys Gly Gln Asp Phe Arg Glu Ile Ile Gln Pro
210 215 220

Ser Lys Lys Gln Gly Asp Arg Tyr Ser Gly Phe Ser Gly Asp Gly Ser
225 230 235 240

Glu Glu Tyr Ser Asn Lys Asn Glu Ser Thr Leu Lys Asp Asp His Glu
245 250 255

Gly Tyr Gly Phe Thr Ser Asn Leu Glu Val Asp Phe Gly Asn Lys Lys
260 265 270

Leu Thr Gly Lys Leu Ile Arg Asn Asn Ala Ser Leu Asn Asn Asn Thr
275 280 285

Asn Asn Asp Lys His Thr Thr Gln Tyr Tyr Ser Leu Asp Ala Gln Ile
290 295 300

Thr Gly Asn Arg Phe Asn Gly Thr Ala Thr Ala Thr Asp Lys Lys Glu
305 310 315 320

Asn Glu Thr Lys Leu His Pro Phe Val Ser Asp Ser Ser Ser Leu Ser
325 330 335

Gly Gly Phe Phe Gly Pro Gln Gly Glu Glu Leu Gly Phe Arg Phe Leu
340 345 350

Ser Asp Asp Gln Lys Val Ala Val Val Gly Ser Ala Lys Thr Lys Asp
355 360 365

Lys Leu Glu Asn Gly Ala Ala Ala Ser Gly Ser Thr Gly Ala Ala Ala
370 375 380

Ser Gly Gly Ala Ala Gly Thr Ser Ser Glu Asn Ser Lys Leu Thr Thr
385 390 395 400

Val Leu Asp Ala Val Glu Leu Thr Leu Asn Asp Lys Lys Ile Lys Asn
405 410 415

Leu Asp Asn Phe Ser Asn Ala Ala Gln Leu Val Val Asp Gly Ile Met
420 425 430

Ile Pro Leu Leu Pro Lys Asp Ser Glu Ser Gly Asn Thr Gln Ala Asp
435 440 445

Lys Gly Lys Asn Gly Gly Thr Glu Phe Thr Arg Lys Phe Glu His Thr
450 455 460

Pro Glu Ser Asp Lys Lys Asp Ala Gln Ala Gly Thr Gln Thr Asn Gly
465 470 475 480

Ala Gln Thr Ala Ser Asn Thr Ala Gly Asp Thr Asn Gly Lys Thr Lys
485 490 495

Thr Tyr Glu Val Glu Val Cys Cys Ser Asn Leu Asn Tyr Leu Lys Tyr
500 505 510

Gly Met Leu Thr Arg Lys Asn Ser Lys Ser Ala Met Gln Ala Gly Gly

```
        515                 520                 525

Asn Ser Ser Gln Ala Asp Ala Lys Thr Glu Gln Val Glu Gln Ser Met
    530                 535                 540

Phe Leu Gln Gly Glu Arg Thr Asp Glu Lys Glu Ile Pro Thr Asp Gln
545                 550                 555                 560

Asn Val Val Tyr Arg Gly Ser Trp Tyr Gly His Ile Ala Asn Gly Thr
                565                 570                 575

Ser Trp Ser Gly Asn Ala Ser Asp Lys Glu Gly Gly Asn Arg Ala Glu
            580                 585                 590

Phe Thr Val Asn Phe Ala Asp Lys Lys Ile Thr Gly Lys Leu Thr Ala
        595                 600                 605

Glu Asn Arg Gln Ala Gln Thr Phe Thr Ile Glu Gly Met Ile Gln Gly
    610                 615                 620

Asn Gly Phe Glu Gly Thr Ala Lys Thr Ala Glu Ser Gly Phe Asp Leu
625                 630                 635                 640

Asp Gln Lys Asn Thr Thr Arg Thr Pro Lys Ala Tyr Ile Thr Asp Ala
                645                 650                 655

Lys Val Lys Gly Gly Phe Tyr Gly Pro Lys Ala Glu Glu Leu Gly Gly
            660                 665                 670

Trp Phe Ala Tyr Pro Gly Asp Lys Gln Thr Glu Lys Ala Thr Ala Thr
        675                 680                 685

Ser Ser Asp Gly Asn Ser Ala Ser Ser Ala Thr Val Val Phe Gly Ala
    690                 695                 700

Lys Arg Gln Gln Pro Val Gln
705                 710
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<210> 99
<211> 546
<212> PRT
<213> Haemophilus influenzae

<400> 99

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Met His Phe Lys Leu Asn Pro Tyr Ala Leu Ala Phe Thr Ser Leu Phe
  1               5                  10                  15

Leu Val Ala Cys Ser Gly Gly Lys Gly Ser Phe Asp Leu Glu Asp Val
            20                  25                  30

Arg Pro Asn Lys Thr Thr Gly Val Ser Lys Glu Glu Tyr Lys Asp Val
        35                  40                  45

Glu Thr Ala Lys Lys Glu Lys Glu Gln Leu Gly Glu Leu Met Glu Pro
    50                  55                  60

Ala Leu Gly Tyr Val Val Lys Val Pro Val Ser Ser Phe Glu Asn Lys
65                  70                  75                  80
```

```
Lys Val Asp Ile Ser Asp Ile Glu Val Ile Thr Asn Gly Asn Leu Asp
                 85                  90                  95

Asp Val Pro Tyr Lys Ala Asn Ser Ser Lys Tyr Asn Tyr Pro Asp Ile
            100                 105                 110

Lys Thr Lys Asp Ser Ser Leu Gln Tyr Val Arg Ser Gly Tyr Val Ile
        115                 120                 125

Asp Gly Glu His Ser Gly Ser Asn Glu Lys Gly Tyr Val Tyr Tyr Lys
    130                 135                 140

Gly Asn Ser Pro Ala Lys Glu Leu Pro Val Asn Gln Leu Leu Thr Tyr
145                 150                 155                 160

Thr Gly Ser Trp Asp Phe Thr Ser Asn Ala Asn Leu Asn Asn Glu Glu
                165                 170                 175

Gly Arg Pro Asn Tyr Leu Asn Asp Asp Tyr Tyr Thr Lys Phe Ile Gly
            180                 185                 190

Lys Arg Val Gly Leu Val Ser Gly Asp Ala Lys Pro Ala Lys His Lys
        195                 200                 205

Tyr Thr Ser Gln Phe Glu Val Asp Phe Ala Thr Lys Lys Met Thr Gly
    210                 215                 220

Lys Ser Asp Lys Glu Lys Thr Ile Tyr Thr Val Asn Ala Asp Ile Arg
225                 230                 235                 240

Gly Asn Arg Phe Thr Gly Ala Ala Thr Ala Ser Asp Lys Asn Lys Gly
                245                 250                 255

Lys Gly Glu Ser Tyr Asn Phe Phe Ser Ala Asp Ser Gln Ser Leu Glu
            260                 265                 270

Gly Gly Phe Tyr Gly Pro Lys Ala Glu Glu Met Ala Gly Lys Phe Val
        275                 280                 285

Ala Asn Asp Lys Ser Leu Phe Ala Val Phe Ser Ala Lys His Asn Gly
    290                 295                 300

Ser Asn Val Asn Thr Val Arg Ile Ile Asp Ala Ser Lys Ile Asp Leu
305                 310                 315                 320

Thr Asn Phe Ser Ile Ser Glu Leu Asn Asn Phe Gly Asp Ala Ser Val
                325                 330                 335

Leu Ile Ile Asp Gly Lys Lys Ile Lys Leu Ala Gly Ser Gly Phe Thr
            340                 345                 350

Asn Lys His Thr Ile Glu Ile Asn Gly Lys Thr Met Val Ala Val Ala
        355                 360                 365

Cys Cys Ser Asn Leu Glu Tyr Met Lys Phe Gly Gln Leu Trp Gln Gln
    370                 375                 380

Ala Glu Gly Gly Lys Pro Glu Asn Asn Ser Leu Phe Leu Gln Gly Glu
```

385 390 395 400

Arg Thr Ala Thr Asp Lys Met Pro Lys Gly Gly Asn Tyr Lys Tyr Ile
405 410 415

Gly Thr Trp Asp Ala Gln Val Ser Lys Glu Asn Asn Trp Val Ala Thr
420 425 430

Ala Asp Asp Asp Arg Lys Ala Gly Tyr Arg Thr Glu Phe Asp Val Asp
435 440 445

Phe Gly Asn Lys Asn Leu Ser Gly Lys Leu Phe Asp Lys Asn Gly Val
450 455 460

Asn Pro Val Phe Thr Val Asp Ala Lys Ile Asp Gly Asn Gly Phe Thr
465 470 475 480

Gly Lys Ala Lys Thr Ser Asp Glu Gly Phe Ala Leu Asp Ser Gly Ser
485 490 495

Ser Arg Tyr Glu Asn Val Lys Phe Asn Asp Val Ala Val Ser Gly Gly
500 505 510

Phe Tyr Gly Pro Thr Ala Ala Glu Leu Gly Gly Gln Phe His His Lys
515 520 525

Ser Glu Asn Gly Ser Val Gly Ala Val Phe Gly Ala Lys Gln Gln Val
530 535 540

Lys Lys
545

<210> 100
<211> 593
<212> PRT
<213> Haemophilus influenzae

<400> 100
Met His Phe Lys Leu Asn Pro Tyr Ala Leu Ala Phe Thr Ser Leu Phe
1 5 10 15

Leu Val Ala Cys Ser Gly Gly Lys Gly Ser Phe Asp Leu Glu Asp Val
20 25 30

Arg Pro Asn Gln Thr Ala Lys Ala Glu Lys Ala Thr Thr Ser Tyr Gln
35 40 45

Asp Glu Glu Thr Lys Lys Lys Thr Lys Glu Glu Leu Asp Lys Leu Met
50 55 60

Glu Pro Ala Leu Gly Tyr Glu Thr Gln Ile Leu Arg Arg Asn Lys Ala
65 70 75 80

Pro Lys Thr Glu Thr Gly Glu Lys Arg Asn Glu Arg Val Val Glu Leu
85 90 95

Ser Glu Asp Lys Ile Thr Lys Leu Tyr Gln Glu Ser Val Glu Ile Ile
100 105 110

```
Pro His Leu Asp Glu Leu Asn Gly Lys Thr Thr Ser Asn Asp Val Tyr
        115                 120                 125

His Ser His Asp Ser Lys Arg Leu Asp Lys Asn Arg Asp Leu Lys Tyr
    130                 135                 140

Val Arg Ser Gly Tyr Val Tyr Asp Gly Ser Phe Asn Glu Ile Arg Arg
145                 150                 155                 160

Asn Asp Ser Gly Phe His Val Phe Lys Gln Gly Ile Asp Gly Tyr Val
                165                 170                 175

Tyr Tyr Leu Gly Val Thr Pro Ser Lys Glu Leu Pro Lys Gly Lys Val
            180                 185                 190

Ile Ser Tyr Lys Gly Thr Trp Asp Phe Val Ser Asn Ile Asn Leu Glu
        195                 200                 205

Arg Glu Ile Asp Gly Phe Asp Thr Ser Gly Asp Gly Lys Asn Val Ser
    210                 215                 220

Ala Thr Ser Ile Thr Glu Thr Val Asn Arg Asp His Lys Val Gly Glu
225                 230                 235                 240

Lys Leu Gly Asp Asn Glu Val Lys Gly Val Ala His Ser Ser Glu Phe
                245                 250                 255

Ala Val Asp Phe Asp Asn Lys Lys Leu Thr Gly Ser Leu Tyr Arg Asn
            260                 265                 270

Gly Tyr Ile Asn Arg Asn Lys Ala Gln Glu Val Thr Lys Arg Tyr Ser
        275                 280                 285

Ile Glu Ala Asp Ile Ala Gly Asn Arg Phe Arg Gly Lys Ala Lys Ala
    290                 295                 300

Glu Lys Ala Gly Asp Pro Ile Phe Thr Asp Ser Asn Tyr Leu Glu Gly
305                 310                 315                 320

Gly Phe Tyr Gly Pro Lys Ala Glu Glu Met Ala Gly Lys Phe Phe Thr
                325                 330                 335

Asn Asn Lys Ser Leu Phe Ala Val Phe Ala Ala Lys Ser Glu Asn Gly
            340                 345                 350

Glu Thr Thr Thr Glu Arg Ile Ile Asp Ala Thr Lys Ile Asp Leu Thr
        355                 360                 365

Gln Phe Asn Ala Lys Glu Leu Asn Asn Phe Gly Asp Ala Ser Val Leu
    370                 375                 380

Ile Ile Asp Gly Gln Lys Ile Asp Leu Ala Gly Val Asn Phe Lys Asn
385                 390                 395                 400

Ser Lys Thr Val Glu Ile Asn Gly Lys Thr Met Val Ala Val Ala Cys
                405                 410                 415

Cys Ser Asn Leu Glu Tyr Met Lys Phe Gly Gln Leu Trp Gln Lys Glu
```

```
           420                 425                 430

Gly Lys Gln Gln Val Lys Asp Asn Ser Leu Phe Leu Gln Gly Glu Arg
        435                 440                 445

Thr Ala Thr Asp Lys Met Pro Ala Gly Gly Asn Tyr Lys Tyr Val Gly
    450                 455                 460

Thr Trp Asp Ala Leu Val Ser Lys Gly Thr Asn Trp Ile Ala Glu Ala
465                 470                 475                 480

Asp Asn Asn Arg Glu Ser Gly Tyr Arg Thr Glu Phe Asp Val Asn Phe
                485                 490                 495

Ser Asp Lys Lys Val Asn Gly Lys Leu Phe Asp Lys Gly Gly Val Asn
            500                 505                 510

Pro Val Phe Thr Val Asp Ala Thr Ile Asn Gly Asn Gly Phe Ile Gly
        515                 520                 525

Ser Ala Lys Thr Ser Asp Ser Gly Phe Ala Leu Asp Ala Gly Ser Ser
    530                 535                 540

Gln His Gly Asn Ala Val Phe Ser Asp Ile Lys Val Asn Gly Gly Phe
545                 550                 555                 560

Tyr Gly Pro Thr Ala Gly Glu Leu Gly Gly Gln Phe His His Lys Ser
                565                 570                 575

Asp Asn Gly Ser Val Gly Ala Val Phe Gly Ala Lys Arg Gln Ile Glu
            580                 585                 590

Lys
```

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<210> 101
<211> 18
<212> PRT
<213> Haemophilus influenzae

<400> 101
Glu Thr Gln Ser Ile Lys Asp Thr Lys Glu Ala Ile Ser Ser Glu Val
  1               5                  10                  15

Asp Thr


<210> 102
<211> 20
<212> PRT
<213> Haemophilus influenzae

<400> 102
Leu Gln Leu Asn Leu Glu Lys Lys Ile Gln Gln Asn Trp Leu Thr His
  1               5                  10                  15

Gln Ile Ala Phe
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20

<210> 103
<211> 23
<212> PRT
<213> Haemophilus influenzae

<400> 103
Met Thr Lys Lys Pro Tyr Phe Arg Leu Ser Ile Ile Ser Cys Leu Leu
1 5 10 15

Ile Ser Cys Tyr Val Lys Ala
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<210> 104
<211> 17
<212> PRT
<213> Haemophilus influenzae

<400> 104
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
1 5 10 15

Ala

<210> 105
<211> 5144
<212> DNA
<213> Haemophilus influenzae

<400> 105
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ataagaaaga aatttgtttt acgccatttt tcatatttta tccatgaact taaaaaattc 120
taagttgaca ttattacaaa aaaagaacaa taatgcgaat tattatcaat tttgtataag 180
aatataattc tatgaaatct gtacctctta tctctggtgg actttccttt ttattaagtg 240
cttgtagcgg aggagggtct tttgatgtag ataacgtctc taatccctcc tcttctaaac 300
cacgttatca agacgatacc tcgaatcaaa gaacaaaatc tgatttgcaa aagttgtcca 360
ttccttcttt agggggaggg atgaagttag tggctcagaa tcttcttggt aagaaagaac 420
ctagtctctt aaataatgaa gatggctata tgatattttc ctcactttct acgattgaag 480
aggatgttac aaaagaaaat aaatctcagg aacccactat tggctcaata gacgagccta 540
gcaaaacaaa ttcaccccaa aatcatcatg gcaatatgta tattcgggtc tttattatat 600
tcaatcgtgg cgtaattcct caaatggcaa gttttattca ggttactatg gatatgcgta 660
ttactttggc aagcaaacag ccactacatt acctgtagat ggcgaagcaa cgtataaagg 720
aacttggcac ttcatcaccg caactgaaaa tggcaaaaag tattctttgt tcagtaatga 780
tagcggtcaa gcttatcgca gacgtagtgc aattccagaa gatattgatt tagaaaaaaa 840
tgattcaact aatggtgaca agggcttaat aagtgaattt agtgtcaatt ttggtacaaa 900
aaagctcact ggaaaacttt attataatga aagagaaaca gaacttaata aatcaaaaga 960
tagaaaacat acactctaca atctagaagc tgaagtgtat agtaaccgat tcaggggtac 1020
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caaggaaacc ttaattgatg gcaagctaac tacttttaaa acaaccaatg caacaaccaa 1260
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tacgacgaaa gatataccaa gttttggtga agctgattac cttttaattg ataattaccc 1380
tgttcctctt ttacctgaga gtggtgattt cataagtagt aagcaccata ctgtaggaaa 1440

gaaaacctat caagtagaag catgttgcag taatctaagc tatgtgaaat ttggtatgtt 1500
ttatgaagac ccacttaaag aagaaaaaga caaagaaaaa gaagaagaca aagaaaaaca 1560
aacggcggca acgaccaaca cttattatca attcttatta ggtctccgta ctgccagttc 1620
tgaaattcct aaaatgggaa acgtggaata tcgcggtaat tggtttggtt atattagtga 1680
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aaccgcaaaa gatttagtaa tagatggtaa aagtacacaa gccacatcta aagtcaattt 1920
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gagttcttct gagtatggta atggagcact agctggttct gtaacatttc aaagcaaatc 2700
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gcttactcat caaattgtct tcaatcttgg ttttgatgac tttacttcag cgcttcagca 3660
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gaaatacatt gatttaggtt taggtattcg gtatgacgta tctcgtacaa aagctaatga 3960
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gaatgtaaaa tcaacaagaa aacttactcg ggcatggcat atcttagatg tatcgggtta 4680
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ctatgttact tgggaagcgg tgcgtcaaac agcacaaggt gcggtcaatc aacatcaaaa 4800
tgttggtagc tatactcgct acgcagcatc aggacgaaac tataccttaa cattagaaat 4860
gaaattctaa attaaaatgc gccagatgga ctagatatgc tatatctata ccttactggc 4920
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atcttttcac gcatttattg taaaatctcc gacaattttt accgcacttt tctctattac 5040
aaaaacaata aggatccttt tgtgactctc tcaatctttg gcaagttgct gttacaactt 5100
cagatcaagt ttcagccagc gatcttaggc acttgggttc ggcc 5144

<210> 106
<211> 168
<212> PRT
<213> Haemophilus influenzae

<400> 106
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
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Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Pro
20 25 30

Ser Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Thr
35 40 45

Lys Ser Asp Leu Gln Lys Leu Ser Ile Pro Ser Leu Gly Gly Gly Met
50 55 60

Lys Leu Val Ala Gln Asn Leu Leu Gly Lys Lys Glu Pro Ser Leu Leu
65 70 75 80

Asn Asn Glu Asp Gly Tyr Met Ile Phe Ser Ser Leu Ser Thr Ile Glu
85 90 95

Glu Asp Val Thr Lys Glu Asn Lys Ser Gln Glu Pro Thr Ile Gly Ser
100 105 110

Ile Asp Glu Pro Ser Lys Thr Asn Ser Pro Gln Asn His His Gly Asn
115 120 125

Met Tyr Ile Arg Val Phe Ile Ile Phe Asn Arg Gly Val Ile Pro Gln
130 135 140

Met Ala Ser Phe Ile Gln Val Thr Met Asp Met Arg Ile Thr Leu Ala
145 150 155 160

Ser Lys Gln Pro Leu His Tyr Leu
165

<210> 107
<211> 911
<212> PRT
<213> Haemophilus influenzae

<400> 107
Met Thr Lys Lys Pro Tyr Phe Arg Leu Ser Ile Ile Ser Cys Leu Leu
1 5 10 15

Ile Ser Cys Tyr Val Lys Ala Glu Thr Gln Ser Ile Lys Asp Thr Lys
20 25 30

Glu Ala Ile Ser Ser Glu Val Asp Thr Gln Ser Thr Glu Asp Ser Glu
35 40 45

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Leu Glu Thr Ile Ser Val Thr Ala Glu Lys Ile Arg Asp Arg Lys Asp
     50                  55                  60

Asn Glu Val Thr Gly Leu Gly Lys Ile Ile Lys Thr Ser Glu Ser Ile
 65                  70                  75                  80

Ser Arg Glu Gln Val Leu Asn Ile Arg Asp Leu Thr Arg Tyr Asp Pro
                 85                  90                  95

Gly Ile Ser Val Val Glu Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ser
            100                 105                 110

Ile Arg Gly Met Asp Arg Asn Arg Val Ala Leu Leu Val Asp Gly Leu
        115                 120                 125

Pro Gln Thr Gln Ser Tyr Val Val Gln Ser Pro Leu Val Ala Arg Ser
    130                 135                 140

Gly Tyr Ser Gly Thr Gly Ala Ile Asn Glu Ile Glu Tyr Glu Asn Val
145                 150                 155                 160

Lys Ala Val Glu Ile Ser Lys Gly Gly Ser Ser Ser Glu Tyr Gly Asn
                165                 170                 175

Gly Ala Leu Ala Gly Ser Val Thr Phe Gln Ser Lys Ser Ala Ala Asp
            180                 185                 190

Ile Leu Glu Gly Asp Lys Ser Trp Gly Ile Gln Thr Lys Asn Ala Tyr
        195                 200                 205

Ser Ser Lys Asn Lys Gly Phe Thr His Ser Leu Ala Val Ala Gly Lys
    210                 215                 220

Gln Gly Gly Phe Glu Gly Val Ala Ile Tyr Thr Gln Arg Asn Ser Glu
225                 230                 235                 240

Glu Thr Gln Val His Lys Asp Ala Leu Lys Gly Val Gln Ser Tyr Glu
                245                 250                 255

Arg Phe Ile Ala Thr Thr Asp Lys Ser Ser Gly Tyr Phe Val Ile Gln
            260                 265                 270

Gly Glu Cys Pro Asn Gly Asp Asp Lys Cys Ala Ala Lys Pro Pro Ala
        275                 280                 285

Lys Leu Ser Pro Gln Ser Glu Thr Val Ser Val Ser Asp Tyr Thr Gly
    290                 295                 300

Ala Asn Arg Ile Lys Pro Asn Pro Met Lys Tyr Glu Ser Gln Ser Trp
305                 310                 315                 320

Phe Leu Arg Gly Gly Tyr His Phe Ser Glu Gln His Tyr Ile Gly Gly
                325                 330                 335

Ile Phe Glu Phe Thr Gln Gln Lys Phe Asp Ile Arg Asp Met Thr Phe
            340                 345                 350

Pro Ala Tyr Leu Arg Ser Thr Glu Lys Arg Asp Asp Arg Thr Gly Pro
```

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        355                 360                 365

Phe Tyr Pro Lys Gln Asp Tyr Gly Ala Tyr Gln Arg Ile Glu Asp Gly
    370                 375                 380

Arg Gly Val Asn Tyr Ala Ser Gly Leu Tyr Phe Asp Glu His His Arg
385                 390                 395                 400

Lys Gln Arg Val Gly Ile Glu Tyr Ile Tyr Glu Asn Lys Asn Lys Ala
                405                 410                 415

Gly Ile Ile Asp Lys Ala Val Leu Ser Ala Asn Gln Gln Asn Ile Ile
            420                 425                 430

Leu Asp Ser Tyr Met Arg His Thr His Cys Ser Leu Tyr Pro Asn Pro
        435                 440                 445

Ser Lys Asn Cys Arg Pro Thr Leu Asp Lys Pro Tyr Ser Tyr Tyr Arg
    450                 455                 460

Ser Asp Arg Asn Val Tyr Lys Glu Lys His Asn Met Leu Gln Leu Asn
465                 470                 475                 480

Leu Glu Lys Lys Ile Gln Gln Asn Trp Leu Thr His Gln Ile Val Phe
                485                 490                 495

Asn Leu Gly Phe Asp Asp Phe Thr Ser Ala Leu Gln His Lys Asp Tyr
            500                 505                 510

Leu Thr Arg Arg Val Thr Ala Thr Ala Asn Ile Ile Ser Gly Thr Val
        515                 520                 525

Ala Gly Lys Arg Arg Asn Gly Tyr Glu Lys Gln Pro Tyr Leu Tyr Ser
    530                 535                 540

Lys Pro Lys Val Asp Phe Val Gly Gln Asp His Cys Asn Tyr Lys Gly
545                 550                 555                 560

Ser Ser Ser Asn Tyr Ser Asp Cys Lys Val Arg Leu Ile Lys Gly Lys
                565                 570                 575

Asn Tyr Tyr Phe Ala Ala Arg Asn Asn Met Ala Leu Gly Lys Tyr Ile
            580                 585                 590

Asp Leu Gly Leu Gly Ile Arg Tyr Asp Val Ser Arg Thr Lys Ala Asn
        595                 600                 605

Glu Ser Thr Ile Ser Val Gly Lys Phe Lys Asn Phe Ser Trp Asn Thr
    610                 615                 620

Gly Ile Val Ile Lys Pro Thr Glu Trp Leu Asp Leu Ser Tyr Arg Leu
625                 630                 635                 640

Ser Thr Gly Phe Arg Asn Pro Ser Phe Ala Glu Met Tyr Gly Trp Arg
                645                 650                 655

Tyr Gly Gly Asn Asn Ser Asp Val Tyr Val Gly Lys Phe Lys Pro Glu
            660                 665                 670
```

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Thr Ser Arg Asn Gln Glu Phe Gly Leu Ala Leu Lys Gly Asp Phe Gly
        675                 680                 685

Asn Ile Glu Ile Ser His Phe Ser Asn Ala Tyr Arg Asn Leu Ile Ala
    690                 695                 700

Phe Ala Glu Glu Leu Ser Lys Asn Gly Thr Thr Gly Lys Gly Asn Tyr
705                 710                 715                 720

Gly Tyr His Asn Ala Gln Asn Ala Lys Leu Val Gly Val Asn Ile Thr
                725                 730                 735

Ala Gln Leu Asp Phe Asn Gly Leu Trp Lys Arg Ile Pro Tyr Gly Trp
            740                 745                 750

Tyr Ala Thr Phe Ala Tyr Asn Arg Val Lys Val Lys Asp Gln Lys Ile
        755                 760                 765

Asn Ala Gly Leu Ala Ser Val Ser Ser Tyr Leu Phe Asp Ala Ile Gln
    770                 775                 780

Pro Ser Arg Tyr Ile Ile Gly Leu Gly Tyr Asp His Pro Ser Asn Thr
785                 790                 795                 800

Trp Gly Ile Asn Thr Met Phe Thr Gln Ser Lys Ala Lys Ser Gln Asn
                805                 810                 815

Glu Leu Leu Gly Gln Arg Ala Leu Gly Asn Asn Ser Arg Asn Val Lys
            820                 825                 830

Ser Thr Arg Lys Leu Thr Arg Ala Trp His Ile Leu Asp Val Ser Gly
        835                 840                 845

Tyr Tyr Met Ala Asn Lys Asn Ile Met Leu Arg Leu Gly Ile Tyr Asn
    850                 855                 860

Leu Phe Asn Tyr Arg Tyr Val Thr Trp Glu Ala Val Arg Gln Thr Ala
865                 870                 875                 880

Gln Gly Ala Val Asn Gln His Gln Asn Val Gly Ser Tyr Thr Arg Tyr
                885                 890                 895

Ala Ala Ser Gly Arg Asn Tyr Thr Leu Thr Leu Glu Met Lys Phe
            900                 905                 910
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<210> 108
<211> 1993
<212> DNA
<213> Haemophilus influenzae

<400> 108
atatgaaatc tgtacctctt atctctggtg gactttcctt tttattaagt gcttgtagcg 60
ggggaggtgg ttcttttgat gtagatgacg tctctaatcc ctcctcttct aaaccacgtt 120
atcaagacga tacttcaagt tcaagaacaa aatctaaatt ggaaaatttg tccattcctt 180
ctttaggggg agggatgaag ttagtggctc agaatcttcg tgataggaca aaacctagtc 240
tcttaaatga agatgactat atgatatttt cctcactttc aacgattaaa gctgatgttg 300
aaaaagaaaa taaacactat acaagtccag ttggctcaat agacgagcct agtacaacaa 360
atccaaaaga aaatgatcat ggacaaagat atgtatattc aggactttat tatattccat 420

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cgtggaattt aaacgatctt aaaaataaca agtattatta ttctggttac tatggatatg 480
cgtattactt tggcaagcaa acagccacta cattacctgt aaatggcaaa gtaacgtata 540
aaggaacttg gagcttcatc accgcagctg aaaatggcaa aaggtatcct ttgttaagta 600
atggcagtca agcttatttt cgacgtagtg caattccaga agatattgat ttagaagtta 660
aaaatgatga gaatagagaa aaagggctag tgagtgaatt tagtgcagat tttgggacta 720
aaaaactgac aggaggactg ttttacacca aaagacaaac tcatattcaa aaccatgaaa 780
agaaaaaact ctatgatata gatgcccata tttatagtaa tagattcaga ggtaaagtaa 840
atcctaccca aaaagattct aaagaacatc cctttaccag cgagggaaca ttagaaggtg 900
gtttttacgg gcctgaaggt caagaattag gaggaaagtt tttagctggc gacaaaaaag 960
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cagccaatgc aacaaccagt accgcagcca atacaacaac cgatacaaca gccaatacaa 1140
taaccgatgc agaaaacttt aagacgaaag atatatcaag ttttggtgaa gctgattacc 1200
ttttaattga taattaccct gttcctcttt tacctgagag tggtgatttc ataagtagta 1260
agcaccatac tgtaggaaag aaaacctatc aagtaaaagc atgttgcagt aatctaagct 1320
atgtgaaatt tggtatgtat tatgaagtcc cacctaaaga agaagaaaaa gacaaagaaa 1380
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gtagttggtt tggttatctg agcgatggtt caacatctta ctcccccagt ggtgataaga 1560
aacgcgagaa caatgctctc gccgagttta atgtaaattt tgtcgataaa acattaaaag 1620
gccaattaat acgacacgat aatcaaaata ccgtttttac aattgatgca acctttaaag 1680
gtggtaagaa taacttcact ggtacagcaa ccgcaaacaa tgtagcgatt gatccccaaa 1740
gtacacaagg cacatctaac gtcaatttca cggcaacagt aaatggggca ttttatgggc 1800
cgaacgctac agaattaggc ggttatttca cctataacgg aaatcctaca gataaaagtt 1860
cctcaaccgt accttcatca tccaattcaa aaaatgcaag agctgcagtt gtctttggtg 1920
cgagacaaca agtagaaaca accaaataat ggaatactaa aaatgactaa aaaagcttct 1980
agaagccgaa ttc                                                    1993
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<210> 109
<211> 648
<212> PRT
<213> Haemophilus influenzae

<400> 109

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Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Gly Ser Phe Asp Val Asp Asp Val Ser Asn
             20                  25                  30

Pro Ser Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Ser Ser Arg
         35                  40                  45

Thr Lys Ser Lys Leu Glu Asn Leu Ser Ile Pro Ser Leu Gly Gly Gly
     50                  55                  60

Met Lys Leu Val Ala Gln Asn Leu Arg Asp Arg Thr Lys Pro Ser Leu
 65                  70                  75                  80

Leu Asn Glu Asp Asp Tyr Met Ile Phe Ser Ser Leu Ser Thr Ile Lys
                 85                  90                  95

Ala Asp Val Glu Lys Glu Asn Lys His Tyr Thr Ser Pro Val Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Lys Glu Asn Asp His Gly Gln
        115                 120                 125
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```
Arg Tyr Val Tyr Ser Gly Leu Tyr Tyr Ile Pro Ser Trp Asn Leu Asn
    130                 135                 140

Asp Leu Lys Asn Asn Lys Tyr Tyr Tyr Ser Gly Tyr Tyr Gly Tyr Ala
145                 150                 155                 160

Tyr Tyr Phe Gly Lys Gln Thr Ala Thr Thr Leu Pro Val Asn Gly Lys
                165                 170                 175

Val Thr Tyr Lys Gly Thr Trp Ser Phe Ile Thr Ala Ala Glu Asn Gly
            180                 185                 190

Lys Arg Tyr Pro Leu Leu Ser Asn Gly Ser Gln Ala Tyr Phe Arg Arg
        195                 200                 205

Ser Ala Ile Pro Glu Asp Ile Asp Leu Glu Val Lys Asn Asp Glu Asn
    210                 215                 220

Arg Glu Lys Gly Leu Val Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys
225                 230                 235                 240

Lys Leu Thr Gly Gly Leu Phe Tyr Thr Lys Arg Gln Thr His Ile Gln
                245                 250                 255

Asn His Glu Lys Lys Lys Leu Tyr Asp Ile Asp Ala His Ile Tyr Ser
            260                 265                 270

Asn Arg Phe Arg Gly Lys Val Asn Pro Thr Gln Lys Asp Ser Lys Glu
        275                 280                 285

His Pro Phe Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro
    290                 295                 300

Glu Gly Gln Glu Leu Gly Gly Lys Phe Leu Ala Gly Asp Lys Lys Val
305                 310                 315                 320

Phe Gly Val Phe Ser Ala Lys Gly Thr Glu Glu Asn Lys Lys Leu Pro
                325                 330                 335

Lys Glu Thr Leu Ile Asp Gly Lys Leu Thr Thr Phe Ser Thr Lys Thr
            340                 345                 350

Thr Asp Ala Lys Thr Asn Ala Thr Ala Asn Ala Thr Thr Ser Thr Ala
        355                 360                 365

Ala Asn Thr Thr Thr Asp Thr Thr Ala Asn Thr Ile Thr Asp Ala Glu
    370                 375                 380

Asn Phe Lys Thr Lys Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu
385                 390                 395                 400

Leu Ile Asp Asn Tyr Pro Val Pro Leu Leu Pro Glu Ser Gly Asp Phe
                405                 410                 415

Ile Ser Ser Lys His His Thr Val Gly Lys Lys Thr Tyr Gln Val Lys
            420                 425                 430

Ala Cys Cys Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu
        435                 440                 445
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Val Pro Pro Lys Glu Glu Glu Lys Asp Lys Glu Lys Lys Glu Lys Glu
    450                 455                 460

Lys Glu Lys Gln Ala Thr Asn Leu Ser Asn Thr Tyr Tyr Gln Phe Leu
465                 470                 475                 480

Leu Gly Leu Arg Thr Pro Ser Ser Glu Ile Pro Lys Gly Gly Ser Ala
                485                 490                 495

Lys Tyr Leu Gly Ser Trp Phe Gly Tyr Leu Ser Asp Gly Ser Thr Ser
            500                 505                 510

Tyr Ser Pro Ser Gly Asp Lys Lys Arg Glu Asn Asn Ala Leu Ala Glu
        515                 520                 525

Phe Asn Val Asn Phe Val Asp Lys Thr Leu Lys Gly Gln Leu Ile Arg
    530                 535                 540

His Asp Asn Gln Asn Thr Val Phe Thr Ile Asp Ala Thr Phe Lys Gly
545                 550                 555                 560

Gly Lys Asn Asn Phe Thr Gly Thr Ala Thr Ala Asn Asn Val Ala Ile
                565                 570                 575

Asp Pro Gln Ser Thr Gln Gly Thr Ser Asn Val Asn Phe Thr Ala Thr
            580                 585                 590

Val Asn Gly Ala Phe Tyr Gly Pro Asn Ala Thr Glu Leu Gly Gly Tyr
        595                 600                 605

Phe Thr Tyr Asn Gly Asn Pro Thr Asp Lys Ser Ser Ser Thr Val Pro
    610                 615                 620

Ser Ser Ser Asn Ser Lys Asn Ala Arg Ala Ala Val Val Phe Gly Ala
625                 630                 635                 640

Arg Gln Gln Val Glu Thr Thr Lys
                645
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<210> 110
<211> 1974
<212> DNA
<213> Haemophilus influenzae

<400> 110
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actaagtgct tgtagcggag gggggtcttt tgatgtagat aacgtctcta atccatcctc 120
ttctaaacca cgttatcaag acgatacttc aagttcaaga acaaaatcta atttgaaaaa 180
gttgtccatt ccttctttag ggggagggat gaagttagtg gctcagaatc ttagtgataa 240
gaacaaacct agtctcttaa atgaagatga ctatatatca tatttttcct cactttctac 300
aattcaagat gatgttaaaa aagaaaataa acgccataca aatccagttg gctcaataga 360
cgagcctaac gcaacaaatc cacccgaaaa gcatcatgga caaagatatg tatattcagg 420
gctttattat attccatcgt ggagtcattc ctcaaatggc aagctttatt taggttacta 480
tggatatgcg ttttattatg gtaataaaac tgcaacaaac ttgccagtaa gcggcatagc 540
taaatacaaa ggaacttggg attttattac tgcaactaaa aatggccaac gttattcttt 600
atttggtagc gcttttggag cttataatag acgcagtgct atttcagaag atatagataa 660
tttagaaaat aatctaaaga atggtgcggg attaactagt gaatttactg tcaattttgg 720

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tacgaaaaag ctcactggaa aactttatta taatgaaagg gaaacaaatc ttaataaatt 780
acaaaagaga aaacatgaac tctatgatat agatgccgat atttatagta atagattcag 840
aggtaaagta aagccaacaa cccaaaaaga ttctcaagaa catcccttta ccagcgaggg 900
aacattagaa ggtggttttt atgggcctaa cggtgaagaa ttaggaggaa agtttttagc 960
tggcgataac cgagtttttg gggtatttag tgccaaagaa gaagaaacaa aagacaaaaa 1020
attatccaga gaaaccttaa ttgatggcaa gctaattact tttaaaagaa ctgatgcaac 1080
aaccaataca gcagccaatg caaaaaccga tgaaaaaaac tttacgacga aagatatacc 1140
aagttttggt gaagctgatt acctttttaat tgataattac cctgttcctc ttttccctga 1200
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attaaatgga gaaaatggca aagaaaaaga aaaagaaaaa gaaaaagaca aagaaaaaca 1380
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cgacatacct gcaacgggaa acgtgaaata tcgcggtaat tggtttggtt atattggtga 1500
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cggaaacaat cctacagata aaaattcctc aaccgtttca ccatccaatt cagcaaatgc 1860
tcgtgctgcc gttgtgtttg gcgctaaaaa acaagtagaa acaaccaaca agtaaaaaca 1920
accaagtaat ggaatactaa aaatgactaa aaaagcttct agaaagccga attc       1974
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<210> 111
<211> 631
<212> PRT
<213> Haemophilus influenzae

<400> 111

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Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Pro
             20                  25                  30

Ser Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Ser Ser Arg Thr
         35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Ser Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60

Lys Leu Val Ala Gln Asn Leu Ser Asp Lys Asn Lys Pro Ser Leu Leu
 65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Gln
                 85                  90                  95

Asp Asp Val Lys Lys Glu Asn Lys Arg His Thr Asn Pro Val Gly Ser
            100                 105                 110

Ile Asp Glu Pro Asn Ala Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Arg Tyr Val Tyr Ser Gly Leu Tyr Tyr Ile Pro Ser Trp Ser His Ser
    130                 135                 140

Ser Asn Gly Lys Leu Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr Tyr
145                 150                 155                 160
```

```
Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Ser Gly Ile Ala Lys Tyr
                165                 170                 175

Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Gln Arg Tyr
            180                 185                 190

Ser Leu Phe Gly Ser Ala Phe Gly Ala Tyr Asn Arg Arg Ser Ala Ile
        195                 200                 205

Ser Glu Asp Ile Asp Asn Leu Glu Asn Asn Leu Lys Asn Gly Ala Gly
    210                 215                 220

Leu Thr Ser Glu Phe Thr Val Asn Phe Gly Thr Lys Lys Leu Thr Gly
225                 230                 235                 240

Lys Leu Tyr Tyr Asn Glu Arg Glu Thr Asn Leu Asn Lys Leu Gln Lys
                245                 250                 255

Arg Lys His Glu Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg
            260                 265                 270

Phe Arg Gly Lys Val Lys Pro Thr Thr Gln Lys Asp Ser Gln Glu His
        275                 280                 285

Pro Phe Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn
    290                 295                 300

Gly Glu Glu Leu Gly Gly Lys Phe Leu Ala Gly Asp Asn Arg Val Phe
305                 310                 315                 320

Gly Val Phe Ser Ala Lys Glu Glu Glu Thr Lys Asp Lys Lys Leu Ser
                325                 330                 335

Arg Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Lys Arg Thr Asp
            340                 345                 350

Ala Thr Thr Asn Thr Ala Ala Asn Ala Lys Thr Asp Glu Lys Asn Phe
        355                 360                 365

Thr Thr Lys Asp Ile Pro Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile
    370                 375                 380

Asp Asn Tyr Pro Val Pro Leu Phe Pro Glu Glu Asn Thr Asn Asp Phe
385                 390                 395                 400

Ile Thr Ser Arg His His Lys Val Gly Asp Lys Thr Tyr Lys Val Glu
                405                 410                 415

Ala Cys Cys Lys Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu
            420                 425                 430

Asp Pro Leu Asn Gly Glu Asn Gly Lys Glu Lys Glu Lys Glu Lys Glu
        435                 440                 445

Lys Asp Lys Glu Lys Gln Ala Thr Thr Ser Ile Lys Thr Tyr Tyr Gln
    450                 455                 460

Phe Leu Leu Gly His Arg Thr Ala Lys Ala Asp Ile Pro Ala Thr Gly
465                 470                 475                 480
```

```
Asn Val Lys Tyr Arg Gly Asn Trp Phe Gly Tyr Ile Gly Asp Asp Lys
                485                 490                 495

Thr Ser Tyr Ser Thr Thr Gly Asp Lys Asn Ala Val Ala Glu Phe Asp
            500                 505                 510

Val Asn Phe Ala Asp Lys Thr Leu Thr Gly Thr Leu Lys Arg His Asp
        515                 520                 525

Asn Gly Asn Pro Val Phe Thr Ile Asn Ala Ser Phe Gln Ser Gly Lys
    530                 535                 540

Asn Asp Phe Thr Gly Thr Ala Thr Ala Asn Asn Val Ala Ile Asp Pro
545                 550                 555                 560

Gln Asn Thr Gln Thr Thr Ser Arg Val Asn Phe Thr Ala Thr Val Asn
                565                 570                 575

Gly Ala Phe Tyr Gly Pro Lys Ala Thr Glu Leu Gly Gly Tyr Phe Thr
            580                 585                 590

Tyr Asn Gly Asn Asn Pro Thr Asp Lys Asn Ser Ser Thr Val Ser Pro
        595                 600                 605

Ser Asn Ser Ala Asn Ala Arg Ala Ala Val Val Phe Gly Ala Lys Lys
    610                 615                 620

Gln Val Glu Thr Thr Asn Lys
625                 630
```

<210> 112
<211> 1951
<212> DNA
<213> Haemophilus influenzae

<400> 112

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caagacgata cctcgagtca aagaacaaaa tctaatttgg aaaagttgtc cattccttct 180
ttaggaggag ggatgaaatt ggtggctcag aatctgagtg gtaataaaga acctagtttc 240
ttaaatggaa atgactatat gatattttcc tcacgttcta cgattaaaga tgatgttgaa 300
aataacaata caaacggggg ggactatatt ggctcaatag acgagcctag tacaacaaat 360
ccactcgaaa agcatcatgg acaaaggtat gtatattcag ggctttatta tattcaatcg 420
tggagtctaa gagatttacc aaagaagttt tattcaggtt actatggata tgcgtattac 480
tttggcaagg aaacagccac tacattacct gtaaatggcg aagcaacgta taaaggaact 540
tgggatttca tcactgcaac tagaaatggc aaaagttatt ctttgttaag taataaccga 600
caagcttatt ccaaacgtag tgcaattcca gaagacattg atttagaaaa tgatccaaag 660
aatggtgaga cgagattaac tagtgaattt actgtgaatt ttggtacgaa aaagctcaca 720
ggtggacttt attaccattt acgtaaaaca aatgctaatg aaaaccaaaa tagaaaacat 780
aaactctaca atctagaagc tgatgtgtat agcaaccgat tcagaggtaa agtaaagcca 840
accaaagagt cttctgaaga acatcccttt accagcgagg gaacattaga aggtggtttt 900
tatgggccta atgctgaaga actaggggga aaatttttag ctagcgataa aaaagttttt 960
ggggtattta gtgccaaaga acagcaagaa acggaagaaa acaaaaaatt actcaaagaa 1020
accttaattg atggcaagct aactactttc tctactaaaa aaaccaatgc aacaaccgat 1080
gcaacaacca gtacaacaac cagtacagca accaatgcaa cagccgatgc agaaaacttt 1140
acgacaaaag atatatcaag ttttggtgaa gctgattatc ttttaattga taattaccct 1200
gttcctcttt tacctgaaaa tactaatgat ttcataagca gtaagcacca tgaggtagga 1260
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ggtaaacact ataaagtgga agcatgttgc aagaatctaa gctatgtgaa atttggtata 1320
tattatgagg ataatgagaa gaacaccaaa attgaaacag aacaatacca ccaatttttg 1380
ttaggtctcc gtactcccag ttctcaaatt cctgcaacgg gaaacgtgaa atatcgcggt 1440
agttggtttg gttatattgg tgatgacaag acatcttact ccactactgg agataaaaat 1500
gctctcgccg agtttgatgt aaatttttacc gataaaaagc taacaggcga attaaaacga 1560
gccgataatc aaaataccgt atttagaatt aatgcagact ttaaaaataa tgataatgcc 1620
ttcaaaggta cagcaaccgc agaaaatttt gtaatagatg gtaacaatag tcaaactgga 1680
aatacccaaa ttaatattaa aactgaagta aatggggcat tttatggtcc gaacgctaca 1740
gaattaggcg gttatttcac ttataacgga aaaaatccta cagataaaaa ttctgaaagt 1800
tcctcaaccg taccttcacc acccaattca ccaaatgcaa gagctgcagt tgtctttggt 1860
gctaaaaaac aagtagaaaa aaacaacaag taaaaacaac caagtaatgg aatactaaaa 1920
atgactaaaa aagcttctag aagccgaatt c                                  1951
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<210> 113
<211> 630
<212> PRT
<213> Haemophilus influenzae

<400> 113

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Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Leu Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Gly Ser Phe Asp Val Asp Asp Val Ser Asn
             20                  25                  30

Pro Ser Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Ser Gln Arg
         35                  40                  45

Thr Lys Ser Asn Leu Glu Lys Leu Ser Ile Pro Ser Leu Gly Gly Gly
     50                  55                  60

Met Lys Leu Val Ala Gln Asn Leu Ser Gly Asn Lys Glu Pro Ser Phe
 65                  70                  75                  80

Leu Asn Gly Asn Asp Tyr Met Ile Phe Ser Ser Arg Ser Thr Ile Lys
                 85                  90                  95

Asp Asp Val Glu Asn Asn Asn Thr Asn Gly Gly Asp Tyr Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Leu Glu Lys His His Gly Gln
        115                 120                 125

Arg Tyr Val Tyr Ser Gly Leu Tyr Tyr Ile Gln Ser Trp Ser Leu Arg
    130                 135                 140

Asp Leu Pro Lys Lys Phe Tyr Ser Gly Tyr Tyr Gly Tyr Ala Tyr Tyr
145                 150                 155                 160

Phe Gly Lys Glu Thr Ala Thr Thr Leu Pro Val Asn Gly Glu Ala Thr
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Arg Asn Gly Lys Ser
            180                 185                 190

Tyr Ser Leu Leu Ser Asn Asn Arg Gln Ala Tyr Ser Lys Arg Ser Ala
        195                 200                 205
```

```
Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Pro Lys Asn Gly Glu Thr
    210                 215                 220

Arg Leu Thr Ser Glu Phe Thr Val Asn Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gly Leu Tyr Tyr His Leu Arg Lys Thr Asn Ala Asn Glu Asn Gln
                245                 250                 255

Asn Arg Lys His Lys Leu Tyr Asn Leu Glu Ala Asp Val Tyr Ser Asn
            260                 265                 270

Arg Phe Arg Gly Lys Val Lys Pro Thr Lys Glu Ser Ser Glu Glu His
        275                 280                 285

Pro Phe Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn
    290                 295                 300

Ala Glu Glu Leu Gly Gly Lys Phe Leu Ala Ser Asp Lys Lys Val Phe
305                 310                 315                 320

Gly Val Phe Ser Ala Lys Glu Gln Gln Glu Thr Glu Glu Asn Lys Lys
                325                 330                 335

Leu Leu Lys Glu Thr Leu Ile Asp Gly Lys Leu Thr Thr Phe Ser Thr
            340                 345                 350

Lys Lys Thr Asn Ala Thr Thr Asp Ala Thr Thr Ser Thr Thr Thr Ser
        355                 360                 365

Thr Ala Thr Asn Ala Thr Ala Asp Ala Glu Asn Phe Thr Thr Lys Asp
    370                 375                 380

Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Asn Tyr Pro
385                 390                 395                 400

Val Pro Leu Leu Pro Glu Asn Thr Asn Asp Phe Ile Ser Ser Lys His
                405                 410                 415

His Glu Val Gly Gly Lys His Tyr Lys Val Glu Ala Cys Cys Lys Asn
            420                 425                 430

Leu Ser Tyr Val Lys Phe Gly Ile Tyr Tyr Glu Asp Asn Glu Lys Asn
        435                 440                 445

Thr Lys Ile Glu Thr Glu Gln Tyr His Gln Phe Leu Leu Gly Leu Arg
    450                 455                 460

Thr Pro Ser Ser Gln Ile Pro Ala Thr Gly Asn Val Lys Tyr Arg Gly
465                 470                 475                 480

Ser Trp Phe Gly Tyr Ile Gly Asp Asp Lys Thr Ser Tyr Ser Thr Thr
                485                 490                 495

Gly Asp Lys Asn Ala Leu Ala Glu Phe Asp Val Asn Phe Thr Asp Lys
            500                 505                 510

Lys Leu Thr Gly Glu Leu Lys Arg Ala Asp Asn Gln Asn Thr Val Phe
        515                 520                 525
```

```
Arg Ile Asn Ala Asp Phe Lys Asn Asn Asp Asn Ala Phe Lys Gly Thr
    530                 535                 540

Ala Thr Ala Glu Asn Phe Val Ile Asp Gly Asn Asn Ser Gln Thr Gly
545                 550                 555                 560

Asn Thr Gln Ile Asn Ile Lys Thr Glu Val Asn Gly Ala Phe Tyr Gly
                565                 570                 575

Pro Asn Ala Thr Glu Leu Gly Gly Tyr Phe Thr Tyr Asn Gly Lys Asn
            580                 585                 590

Pro Thr Asp Lys Asn Ser Glu Ser Ser Ser Thr Val Pro Ser Pro Pro
        595                 600                 605

Asn Ser Pro Asn Ala Arg Ala Ala Val Val Phe Gly Ala Lys Lys Gln
    610                 615                 620

Val Glu Lys Asn Asn Lys
625                 630
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<210> 114
<211> 1955
<212> DNA
<213> Haemophilus influenzae

<400> 114
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gacgatacct cgaatcaaag aacaaaatct aaattggaaa agttgtccat tccttcttta 180
ggaggaggga tgaagttagt tgtgcaaaat tttgctggtg ctaaagaacc tagtttctta 240
aatgaaaatg actatatatc atatttttcc tcactttcta tgattaaaga tgatgttgaa 300
aataacaata aaaataagga tactccaatt ggctcaatag acgagcctag agcaccaaat 360
tcaaacgaaa atcatcaaaa tcatcatgga cagcaatatg tatattcggg tctttattat 420
attccatcgt ggcgtctaat aaatttacca aataagtttt attcaggtta ctatggatat 480
gcgtattact ttggcaagca aactgccact acattacctg taaatggcga agcaacgtat 540
aaaggaactt ggagcttcat caccgcaact gaaagaggca aaaattattc tttgttcaat 600
aatagaggtc aagcttattc tcgacgtagt gctactccag gagatattga tttagaaaac 660
ggtgacgcag gcttaacaag tgaatttact gtcaattttg gtacaaaaaa gctcactgga 720
gaaccttatt ataatgaaag ggaaacaaat cttaatcaat caaaagatag aaaacataaa 780
ctctacgatc tagaagctga tgtgtatagc aaccgattca gaggtacagt aaagccaacc 840
aaaaaagagt cttctgaaga acatcccttt accagcgagg gaacattaga aggtggtttt 900
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gatggcaagc taactacttt ctctaaaaca accgatacaa caaccaataa aacaaccagt 1080
gcaaaaacca atacagaaaa ctttacgaca aaagatatac caagttttgg tgaagctgat 1140
tatcttttaa ttgataatta ccctattccg cttttacctg agagtggtga tttcataagt 1200
agtaagcacc atgaggtagg aggtaaacgc tataaagtgg aagcatgttg caagaatcta 1260
tgctatgtga aatttggtat gtattatgag gataaagaga acaacaaaaa tgaaacagac 1320
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aaaaatgctc ccgccgagtt taatgctgat tttaacaata aaaagctaac aggcacatca 1560
aaacgacacg ataatcaaaa tcccgtgttt aacattaagg caacctttca aaatggtcgg 1620
aatgactttg aaggtacagc aaccgcagaa aattttgtaa tagatggtaa agatagtcaa 1680
ggaaataccc caattaatat tacaactaaa gtaaacgggg cattttatgg acctgatgct 1740
tctgaattag gcggttattt cacctataac ggaaaagaca ctataactaa aaatactgaa 1800

agttcctcaa ccgtaccttc accacccaat tcaccaaatg caagagctgc agttgtgttt 1860
ggagctaaaa aacaagtaga aacaaccaac aagtagaaaa aaacaaataa tggaatacta 1920
aaaatgacta aaaaagcttc tagaaagccg aattc 1955

<210> 115
<211> 631
<212> PRT
<213> Haemophilus influenzae

<400> 115

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Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
             20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Thr
         35                  40                  45

Lys Ser Lys Leu Glu Lys Leu Ser Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60

Lys Leu Val Val Gln Asn Phe Ala Gly Ala Lys Glu Pro Ser Phe Leu
 65                  70                  75                  80

Asn Glu Asn Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Met Ile Lys
                 85                  90                  95

Asp Asp Val Glu Asn Asn Asn Lys Asn Lys Asp Thr Pro Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Arg Ala Pro Asn Ser Asn Glu Asn His Gln Asn His
        115                 120                 125

His Gly Gln Gln Tyr Val Tyr Ser Gly Leu Tyr Tyr Ile Pro Ser Trp
    130                 135                 140

Arg Leu Ile Asn Leu Pro Asn Lys Phe Tyr Ser Gly Tyr Tyr Gly Tyr
145                 150                 155                 160

Ala Tyr Tyr Phe Gly Lys Gln Thr Ala Thr Thr Leu Pro Val Asn Gly
                165                 170                 175

Glu Ala Thr Tyr Lys Gly Thr Trp Ser Phe Ile Thr Ala Thr Glu Arg
            180                 185                 190

Gly Lys Asn Tyr Ser Leu Phe Asn Asn Arg Gly Gln Ala Tyr Ser Arg
        195                 200                 205

Arg Ser Ala Thr Pro Gly Asp Ile Asp Leu Glu Asn Gly Asp Ala Gly
    210                 215                 220

Leu Thr Ser Glu Phe Thr Val Asn Phe Gly Thr Lys Lys Leu Thr Gly
225                 230                 235                 240

Glu Pro Tyr Tyr Asn Glu Arg Glu Thr Asn Leu Asn Gln Ser Lys Asp
                245                 250                 255
```

```
Arg Lys His Lys Leu Tyr Asp Leu Glu Ala Asp Val Tyr Ser Asn Arg
            260                 265                 270

Phe Arg Gly Thr Val Lys Pro Thr Lys Lys Glu Ser Ser Glu Glu His
        275                 280                 285

Pro Phe Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn
    290                 295                 300

Ala Glu Glu Leu Gly Gly Lys Phe Leu Ala Ser Asp Lys Lys Val Phe
305                 310                 315                 320

Gly Val Phe Ser Ala Lys Glu Thr Glu Glu Lys Pro Lys Leu Pro Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Thr Thr Phe Ser Lys Thr Thr Asp
            340                 345                 350

Thr Thr Thr Asn Lys Thr Thr Ser Ala Lys Thr Asn Thr Glu Asn Phe
        355                 360                 365

Thr Thr Lys Asp Ile Pro Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile
    370                 375                 380

Asp Asn Tyr Pro Ile Pro Leu Leu Pro Glu Ser Gly Asp Phe Ile Ser
385                 390                 395                 400

Ser Lys His His Glu Val Gly Gly Lys Arg Tyr Lys Val Glu Ala Cys
                405                 410                 415

Cys Lys Asn Leu Cys Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Lys
            420                 425                 430

Glu Asn Asn Lys Asn Glu Thr Asp Lys Glu Lys Glu Lys Gln Thr Thr
        435                 440                 445

Thr Ser Ile Lys Thr Tyr Tyr Gln Phe Leu Leu Gly Leu Arg Thr Pro
    450                 455                 460

Ser Ser Glu Ile Pro Lys Met Gly Asn Val Thr Tyr Arg Gly Ser Trp
465                 470                 475                 480

Phe Gly Tyr Ile Gly Asp Asp Lys Thr Ser Tyr Ser Ala Thr Gly Asp
                485                 490                 495

Lys Arg Gln Asp Lys Asn Ala Pro Ala Glu Phe Asn Ala Asp Phe Asn
            500                 505                 510

Asn Lys Lys Leu Thr Gly Thr Ser Lys Arg His Asp Asn Gln Asn Pro
        515                 520                 525

Val Phe Asn Ile Lys Ala Thr Phe Gln Asn Gly Arg Asn Asp Phe Glu
    530                 535                 540

Gly Thr Ala Thr Ala Glu Asn Phe Val Ile Asp Gly Lys Asp Ser Gln
545                 550                 555                 560

Gly Asn Thr Pro Ile Asn Ile Thr Thr Lys Val Asn Gly Ala Phe Tyr
                565                 570                 575
```

Gly Pro Asp Ala Ser Glu Leu Gly Gly Tyr Phe Thr Tyr Asn Gly Lys
580 585 590

Asp Thr Ile Thr Lys Asn Thr Glu Ser Ser Ser Thr Val Pro Ser Pro
595 600 605

Pro Asn Ser Pro Asn Ala Arg Ala Ala Val Val Phe Gly Ala Lys Lys
610 615 620

Gln Val Glu Thr Thr Asn Lys
625 630

<210> 116
<211> 100
<212> DNA
<213> Haemophilus influenzae

<400> 116
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<210> 117
<211> 100
<212> DNA
<213> Haemophilus influenzae

<400> 117
tctaacttga cattattaca aaaaaagatc aataatgcga attattatca attttgtatg 60
agtatataat tctatgaaat ctgtacctct tatctctggt 100

<210> 118
<211> 99
<212> DNA
<213> Haemophilus influenzae

<400> 118
tctaagttga cattattaca aaaaaagaac aataatgcga attattatca attttgtata 60
agtattaatt ctatgaaatc tgtacctctt atctctggt 99

<210> 119
<211> 100
<212> DNA
<213> Haemophilus influenzae

<400> 119
tctaagttga cattattaca aaaaaagaac aataatgcga attattatca attttgtata 60
agaatataat tctatgaaat ctgtacctct tatctctggt 100

<210> 120
<211> 35
<212> DNA
<213> Haemophilus influenzae

<400> 120
ggatccatat gaaatctgta cctcttatct ctggt 35

<210> 121
<211> 61
<212> DNA
<213> Haemophilus influenzae

<400> 121
gtagaaacaa ccaaataatg gaatactaaa aatgactaaa aaaccctatt ttcgcctaag 60
t 61

<210> 122
<211> 61
<212> DNA
<213> Haemophilus influenzae

<400> 122
gtagaaacaa ccaaataatg gaatactaaa aatgactaaa aaaccctatt ttcgcctaag 60
t 61

<210> 123
<211> 61
<212> DNA
<213> Haemophilus influenzae

<400> 123
gtagaaacaa ccaagtaatg gaatactaaa aatgactaaa aaaccctatt ttcgcctaag 60
t 61

<210> 124
<211> 78
<212> DNA
<213> Haemophilus influenzae

<400> 124
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ccctattttc gcctaagt 78

<210> 125
<211> 43
<212> DNA
<213> Haemophilus influenzae

<400> 125
gtagaaacaa ccaaataatg gaatactaaa aatgactaaa aaa 43

<210> 126
<211> 60
<212> DNA
<213> Haemophilus influenzae

<400> 126

gtagaaacaa ccaacaagta aaaacaacca agtaatggaa tactaaaaat gactaaaaaa 60

<210> 127
<211> 60
<212> DNA
<213> Haemophilus influenzae

<400> 127
gtagaaaaaa acaactagta aaaacaacca agtaatggaa tactaaaaat gactaaaaaa 60

<210> 128
<211> 60
<212> DNA
<213> Haemophilus influenzae

<400> 128
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<210> 129
<211> 35
<212> DNA
<213> Haemophilus influenzae

<400> 129
tctagaagct tttttagtca tttttagtat tccat 35

<210> 130
<211> 58
<212> DNA
<213> Haemophilus influenzae

<400> 130
tatgtgttct ggtggtggtt ctttcgacgt tgacaacgtt tctaacactc cctcttct 58

<210> 131
<211> 59
<212> DNA
<213> Haemophilus influenzae

<400> 131
acacaagacc accaccaaga aagctgcaac tgttgcaaag attgtgaggg agaagattt 59

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<212> PRT
<213> Haemophilus influenzae

<400> 132
Asn Pro Ala Ser Thr Thr Asn Lys Asp
1 5

<210> 133

<211> 17
<212> PRT
<213> Haemophilus influenzae

<400> 133
Asn Pro Ala Ser Thr Thr Ser Leu Glu Gly Gly Phe Tyr Gly Pro Lys
1 5 10 15

Asp

<210> 134
<211> 16
<212> PRT
<213> Haemophilus influenzae

<400> 134
Asn Pro Ala Ser Thr Thr Ser Leu Glu Gly Gly Phe Tyr Gly Lys Asp
1 5 10 15

<210> 135
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<213> Haemophilus influenzae

<400> 135
Asn Pro Ala Ser Thr Thr Leu Glu Gly Gly Phe Tyr Gly Pro Lys Asp
1 5 10 15

<210> 136
<211> 15
<212> PRT
<213> Haemophilus influenzae

<400> 136
Asn Pro Ala Ser Thr Thr Leu Glu Gly Gly Phe Tyr Gly Lys Asp
1 5 10 15

<210> 137
<211> 35
<212> DNA
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<400> 137
tctagaagct tttttagtca tttttagtat tccat 35

<210> 138
<211> 4
<212> PRT
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<400> 138
Met Thr Lys Lys
1

<210> 139
<211> 5
<212> PRT
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<400> 139
Glu Gln Val Leu Asn
1 5

<210> 140
<211> 9
<212> PRT
<213> Haemophilus influenzae

<400> 140
Asp Ile Arg Asp Leu Thr Arg Tyr Asp
1 5

<210> 141
<211> 18
<212> PRT
<213> Haemophilus influenzae

<400> 141
Gly Ala Ile Asn Glu Ile Glu Tyr Glu Asn Val Lys Ala Val Glu Ile
1 5 10 15

Ser Lys

<210> 142
<211> 5
<212> PRT
<213> Haemophilus influenzae

<400> 142
Val Tyr Asn Leu Phe
1 5

<210> 143
<211> 9
<212> PRT
<213> Haemophilus influenzae

<400> 143
Leu Asn Tyr Arg Tyr Val Thr Trp Glu
1 5

<210> 144
<211> 9
<212> PRT
<213> Haemophilus influenzae

<400> 144
Cys Ser Gly Gly Gly Gly Ser Phe Asp
1 5

<210> 145
<211> 9
<212> PRT
<213> Haemophilus influenzae

<400> 145
Cys Leu Gly Gly Gly Gly Ser Phe Asp
1 5

<210> 146
<211> 8
<212> PRT
<213> Haemophilus influenzae

<400> 146
Leu Ser Gly Gly Phe Phe Gly Pro
1 5

<210> 147
<211> 10
<212> PRT
<213> Haemophilus influenzae

<400> 147
Met Lys Ser Val Pro Leu Ile Ser Gly Ser
1 5 10

<210> 148
<211> 647
<212> PRT
<213> Haemophilus influenzae

<400> 148
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
1 5 10 15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
20 25 30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
35 40 45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
50 55 60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65 70 75 80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
85 90 95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
100 105 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
115 120 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
130 135 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145 150 155 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
165 170 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
180 185 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
195 200 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
210 215 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225 230 235 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
245 250 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
260 265 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
275 280 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
290 295 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305 310 315 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
325 330 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
340 345 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
355 360 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
370 375 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385 390 395 400

Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser

```
                405                 410                 415

Lys His His Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala Cys Cys
            420                 425                 430

Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Pro Leu
        435                 440                 445

Lys Glu Lys Glu Thr Glu Thr Glu Thr Glu Thr Glu Lys Asp Lys Glu
    450                 455                 460

Lys Glu Lys Glu Lys Asp Lys Asp Lys Glu Lys Gln Thr Ala Ala Thr
465                 470                 475                 480

Thr Asn Thr Tyr Tyr Gln Phe Leu Leu Gly His Arg Thr Pro Lys Asp
                485                 490                 495

Asp Ile Pro Lys Thr Gly Ser Ala Lys Tyr His Gly Ser Trp Phe Gly
            500                 505                 510

Tyr Ile Thr Asp Gly Lys Thr Ser Tyr Ser Pro Ser Gly Asp Lys Lys
        515                 520                 525

Arg Asp Lys Asn Ala Val Ala Glu Phe Asn Val Asp Phe Ala Glu Lys
    530                 535                 540

Lys Leu Thr Gly Glu Leu Lys Arg His Asp Thr Gly Asn Pro Val Phe
545                 550                 555                 560

Ser Ile Glu Ala Asn Phe Asn Asn Ser Ser Asn Ala Phe Thr Gly Thr
                565                 570                 575

Ala Thr Ala Thr Asn Phe Val Ile Asp Gly Lys Asn Ser Gln Asn Lys
            580                 585                 590

Asn Thr Pro Ile Asn Ile Thr Thr Lys Val Asn Gly Ala Phe Tyr Gly
        595                 600                 605

Pro Lys Ala Ser Glu Leu Gly Gly Tyr Phe Thr Tyr Asn Gly Asn Ser
    610                 615                 620

Thr Ala Thr Asn Ser Glu Ser Ser Ser Thr Val Ser Ser Ser Ser Asn
625                 630                 635                 640

Ser Lys Asn Ala Arg Ala Ala
                645
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<210> 149
<211> 547
<212> PRT
<213> Haemophilus influenzae

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<400> 149
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1                 5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
             20                  25                  30
```

```
Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
          35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
 65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
```

```
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser
                405                 410                 415

Lys His His Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala Cys Cys
            420                 425                 430

Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Pro Leu
        435                 440                 445

Lys Glu Lys Glu Thr Glu Thr Glu Thr Glu Thr Glu Lys Asp Lys Glu
    450                 455                 460

Lys Glu Lys Glu Lys Asp Lys Asp Lys Glu Lys Gln Thr Ala Ala Thr
465                 470                 475                 480

Thr Asn Thr Tyr Tyr Gln Phe Leu Leu Gly His Arg Thr Pro Lys Asp
                485                 490                 495

Asp Ile Pro Lys Thr Gly Ser Ala Lys Tyr His Gly Ser Trp Phe Gly
            500                 505                 510

Tyr Ile Thr Asp Gly Lys Thr Ser Tyr Ser Pro Ser Gly Asp Lys Lys
        515                 520                 525

Arg Asp Lys Asn Ala Val Ala Glu Phe Asn Val Asp Phe Ala Glu Lys
    530                 535                 540

Lys Leu Thr
545
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<210> 150
<211> 529
<212> PRT
<213> Haemophilus influenzae

<400> 150

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Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
             20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
         35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60
```

```
Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
 65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
```

```
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser
                405                 410                 415

Lys His His Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala Cys Cys
            420                 425                 430

Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Pro Leu
        435                 440                 445

Lys Glu Lys Glu Thr Glu Thr Glu Thr Glu Thr Glu Lys Asp Lys Glu
    450                 455                 460

Lys Glu Lys Glu Lys Asp Lys Asp Lys Glu Lys Gln Thr Ala Ala Thr
465                 470                 475                 480

Thr Asn Thr Tyr Tyr Gln Phe Leu Leu Gly His Arg Thr Pro Lys Asp
                485                 490                 495

Asp Ile Pro Lys Thr Gly Ser Ala Lys Tyr His Gly Ser Trp Phe Gly
            500                 505                 510

Tyr Ile Thr Asp Gly Lys Thr Ser Tyr Ser Pro Ser Gly Asp Lys Lys
        515                 520                 525

Arg
```

<210> 151
<211> 463
<212> PRT
<213> Haemophilus influenzae

<400> 151

```
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
    50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110
```

```
Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser
                405                 410                 415

Lys His His Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala Cys Cys
```

```
            420                 425                 430

Ser Asn Leu Ser Tyr Val Lys Phe Gly Met Tyr Tyr Glu Asp Pro Leu
        435                 440                 445

Lys Glu Lys Glu Thr Glu Thr Glu Thr Glu Thr Glu Lys Asp Lys
    450                 455                 460


<210> 152
<211> 430
<212> PRT
<213> Haemophilus influenzae

<400> 152
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
             20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
         35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
 65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240
```

```
Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser
                405                 410                 415

Lys His His Thr Val Gly Asn Lys Arg Tyr Lys Val Glu Ala
            420                 425                 430
```

<210> 153
<211> 417
<212> PRT
<213> Haemophilus influenzae

<400> 153

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Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
    50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65                  70                  75                  80
```

```
Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                 85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400
```

```
Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn Asp Phe Ile Ser Ser
                405                 410                 415

Lys


<210> 154
<211> 411
<212> PRT
<213> Haemophilus influenzae

<400> 154
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
    50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240
```

```
Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

Pro Ile Pro Leu Leu Pro Asp Lys Asn Thr Asn
                405                 410
```

<210> 155
<211> 404
<212> PRT
<213> Haemophilus influenzae

<400> 155

```
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1                 5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
             20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
         35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
 65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                 85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
```

```
                100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn Thr Thr Thr
        355                 360                 365

Asp Thr Thr Ala Asn Thr Ile Thr Asp Glu Lys Asn Phe Lys Thr Glu
    370                 375                 380

Asp Ile Ser Ser Phe Gly Glu Ala Asp Tyr Leu Leu Ile Asp Lys Tyr
385                 390                 395                 400

Pro Ile Pro Leu
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<210> 156
<211> 365
<212> PRT
<213> Haemophilus influenzae

<400> 156
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
1 5 10 15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
20 25 30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
35 40 45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
50 55 60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65 70 75 80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
85 90 95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
100 105 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
115 120 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
130 135 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145 150 155 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
165 170 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
180 185 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
195 200 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
210 215 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225 230 235 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
245 250 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
260 265 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe

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        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe Leu Ala Thr Asp Asn Arg Val Phe Gly Val
305                 310                 315                 320

Phe Ser Ala Lys Glu Thr Glu Glu Thr Lys Lys Glu Ala Leu Ser Lys
                325                 330                 335

Glu Thr Leu Ile Asp Gly Lys Leu Ile Thr Phe Ser Thr Lys Lys Thr
            340                 345                 350

Asp Ala Lys Thr Asn Ala Thr Thr Ser Thr Ala Ala Asn
        355                 360                 365


<210> 157
<211> 310
<212> PRT
<213> Haemophilus influenzae

<400> 157
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
    50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140

Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190
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```
Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala Asp Ile Tyr Ser Asn Arg Phe
            260                 265                 270

Arg Gly Thr Val Lys Pro Thr Glu Lys Asp Ser Glu Glu His Pro Phe
        275                 280                 285

Thr Ser Glu Gly Thr Leu Glu Gly Gly Phe Tyr Gly Pro Asn Ala Glu
    290                 295                 300

Glu Leu Gly Gly Lys Phe
305                 310
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<210> 158
<211> 265
<212> PRT
<213> Haemophilus influenzae

<400> 158

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Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
 65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu Lys His His Gly Gln
        115                 120                 125

Lys Tyr Val Tyr Ser Gly Leu Tyr Tyr Thr Pro Ser Trp Ser Leu Asn
    130                 135                 140
```

```
Asp Ser Lys Asn Lys Phe Tyr Leu Gly Tyr Tyr Gly Tyr Ala Phe Tyr
145                 150                 155                 160

Tyr Gly Asn Lys Thr Ala Thr Asn Leu Pro Val Asn Gly Val Ala Lys
                165                 170                 175

Tyr Lys Gly Thr Trp Asp Phe Ile Thr Ala Thr Lys Asn Gly Lys Arg
            180                 185                 190

Tyr Pro Leu Leu Ser Asn Gly Ser His Ala Tyr Tyr Arg Arg Ser Ala
        195                 200                 205

Ile Pro Glu Asp Ile Asp Leu Glu Asn Asp Ser Lys Asn Gly Asp Ile
    210                 215                 220

Gly Leu Ile Ser Glu Phe Ser Ala Asp Phe Gly Thr Lys Lys Leu Thr
225                 230                 235                 240

Gly Gln Leu Ser Tyr Thr Lys Arg Lys Thr Asn Asn Gln Pro Tyr Glu
                245                 250                 255

Lys Lys Lys Leu Tyr Asp Ile Asp Ala
            260                 265
```

<210> 159
<211> 123
<212> PRT
<213> Haemophilus influenzae

<400> 159

```
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
            20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
        35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
    50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
65                  70                  75                  80

Asn Glu Asp Asp Tyr Ile Ser Tyr Phe Ser Ser Leu Ser Thr Ile Glu
                85                  90                  95

Lys Asp Val Lys Asp Asn Asn Lys Asn Gly Ala Asp Leu Ile Gly Ser
            100                 105                 110

Ile Asp Glu Pro Ser Thr Thr Asn Pro Pro Glu
        115                 120
```

<210> 160
<211> 82
<212> PRT

<213> Haemophilus influenzae

<400> 160

```
Met Lys Ser Val Pro Leu Ile Ser Gly Gly Leu Ser Phe Leu Leu Ser
  1               5                  10                  15

Ala Cys Ser Gly Gly Gly Ser Phe Asp Val Asp Asn Val Ser Asn Thr
             20                  25                  30

Pro Ser Ser Lys Pro Arg Tyr Gln Asp Asp Thr Ser Asn Gln Arg Lys
         35                  40                  45

Lys Ser Asn Leu Lys Lys Leu Phe Ile Pro Ser Leu Gly Gly Gly Met
     50                  55                  60

Lys Leu Val Ala Gln Asn Leu Arg Gly Asn Lys Glu Pro Ser Phe Leu
 65                  70                  75                  80

Asn Glu
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